



THE INSTITUTION OF ENGINEERS, AUSTRALIA  
WESTERN AUSTRALIAN DIVISION

ORAL HISTORY PROJECT

Transcript of interviews with

**HAROLD ERNEST HUNT**

Education at Perth Modern School and University of Western Australia, PWD cadet engineer, graduate engineer on Stirling and Samson Brook Dam, war service in Australian Electrical and Mechanical Engineers (Light Aid Detachments), PWD Resident Engineer Raising of Mundaring Weir, Construction Engineer on Major Hydraulic Structures, Chief Engineer PWD (1970-71), Chief Engineer Metropolitan Water Board (1972-1980)

Access  
RESEARCH – OPEN

Ref No:	OH3173
Interviewer:	Richard G Hartley
Dates of Interview:	18, 24 & 31 March and 7 April 1999
Duration:	5 x 90 minute cassettes
Transcriber:	Anne McBride
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## HAROLD ERNEST HUNT

Apart from four years war service in the army, Harold Hunt worked as a civil engineer for Western Australian Government water supply undertakings from 1939 to 1980, the last eight years of which he spent as Chief Engineer of the Metropolitan Water Board. Subsequently he has worked as a consultant Arbitrator specialising in construction industry disputes.

Harold Hunt was born in Cottesloe, Western Australia, in 1917, and received his primary and secondary education at Buckland Hill State School, Geraldton District High School and Perth Modern School. He worked briefly as a teaching monitor before being awarded an engineering cadetship with the Public Works Department in 1935, and commencing engineering studies at the University of Western Australia. In his course fieldwork, in 1937, Hunt carried out water utilisation studies in the Harvey Irrigation Scheme. He played rugby, cricket and Australian Rules football for the University, gaining a half-blue for Australian Rules in 1938. On graduation he joined the Department's Hydraulic Engineer's branch and supervised the construction through hard rock of the diversion tunnels for the Stirling and Samson Brook Dams (for irrigation water).

Hunt joined the Australian Electrical and Mechanical Engineers in 1941 and for most of the war was Captain in command of Light Aid Detachments (mobile repair workshops) including ones operating in Bougainville and Wewak, New Guinea. On demobilisation he rejoined the Department and from 1946 to 1951 he was Resident Engineer on the raising of Mundaring Weir, the first major dam to be raised in Australia. During the 1950s he was construction engineer for over 15 major dams providing water supplies to country towns in the south-west and mid-west. In the late 1950s, he was responsible for the construction of the first major hydraulic works in the Kimberleys, the Camballin Scheme on the Fitzroy River and Stage 1 of the Ord River Irrigation Scheme (the Ord River Diversion Dam, irrigation channels and farmland earthworks). During the course of this work Hunt was largely responsible for introducing into the Department the contract system for the construction of major works.

In 1970 he was appointed Chief Engineer for the Public Works Department, under D.C. Munro, Director of Engineering. In 1972 he transferred to the Metropolitan Water Board (MWB) as its Chief Engineer, the Board's most senior engineering position. The MWB was responsible for all water supply, sewerage and main drainage within the Perth Metropolitan Area, and in the early 1970s was engaged in a major expansion of works. These included the development of metropolitan groundwater resources, an infill sewerage programme assisted by the Commonwealth Government and the development of two major new sewage treatment plants. In 1978 Hunt was instrumental in obtaining Commonwealth



funding for a comprehensive MWB Development Study (the 'Binnie Report') which initiated five year development plans, more equitable charging policies and strategies for the financing of future operations.

Hunt was Chairman of the Regional Zone Development Committees for Albany and the South-West (1964-72). He was a member of the Metropolitan Region Planning Authority (1972-81) and also of the EPA Conservation Through Reserves Committee for the System 6 Darling Range. Because of the interconnections between urban planning and water supplies he was also Chairman of the Darling Range Salinities Studies Committee (1974-80) and of the Western Australian Quality of Water Committee (1972-1980).

Hunt is a Fellow of Institution of Engineers, Australia and was a member of the Western Australian Division Committee from 1967 to 1974. He was Division Chairman in 1974. His publications include: 'The Raising of Mundaring Weir, Western Australia', *Journal IEAust* Vol.25, 1953 (with D.C. Munro); 'MWSS&D Board – New Directions', *IEAust Diamond Jubilee Conference 1979*, Paper 403.1 (with L.B. Devin & J.S. Hetherington); *Perth's Early Water Supplies*, WA Division, IEAust, 1984.

## HAROLD E. HUNT

### ORAL HISTORY

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# INTERVIEW – HAROLD ERNEST HUNT

at 4B Rockton Road, Nedlands, WA  
on 18, 24 & 31 March and 7 April 1999  
Interviewer – Richard Hartley

## TAPES 1, 2 & 3

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### Side A, Tape 1

- RH This is Richard Hartley on the 18 March 1999. I am talking to Harold Hunt about his life and career in engineering at 4B Rockton Road, Nedlands. Good morning Harold.
- HH Good morning Richard
- RH Where were you born, Harold?
- HH I was born [on 21 October 1917], not so far from here, in Cottesloe.
- RH And were your parents Australian?
- HH No, my parents had come to Australia with my father's brothers and sister via Canada, and they came here ... oh a few years before the start of the 14-18 war.
- RH Your brother and sisters were older than you, weren't they?
- HH That's right. The two older children of the family were Canadians. My sister [Winifred] was 10 years older, my brother [Frederick] was seven years older, and then my other sister [Olive] was born in England. She was five years older than me.
- RH Whereabouts in England did your parents live?
- HH My mother lived in London. Her grandfather had emigrated to Britain from Denmark, and my father's family had been in the west country, in Swindon in Wiltshire.
- RH On the Great Western Railway, wasn't it? Swindon.
- HH Yes.
- RH And he was a metal worker.
- HH That's right.
- RH And where did he work when he first came to Western Australia?
- HH I think he went straight, or pretty shortly after he came here, into the State Implement Works at North Fremantle, which was the predecessor of the State Engineering Works.
- RH That would be very close to home then.

HH Oh, well you see he used to walk to work. He walked through the bush which surrounded the end of our street.

RH And where did you go to primary school?

HH I went to primary school at what was then known as Buckland Hill State School. The district was called Cottesloe Beach. It's now Mosman Park, so it would now be known as the Mosman Park State School, and I did my full six years of primary school there.

RH Is that on the Stirling Highway – the school?

HH No, that's Cottesloe School. No, I was at Cottesloe Beach, which is not quite at the foot of Buckland Hill, but in a street, I think it's called Victoria Street.

RH And your father and the family went up to Geraldton. Did he go up there to work?

HH Yes. He was working on the Geraldton Harbour construction.

RH So he was with the Public Works Department then.

HH Yes. There was quite a link between the State Engineering Works and the Harbours and Rivers Branch.

RH Presumably they did all the fabrication work for Harbours and Rivers, the State Engineering Works.

HH That's right.

RH What can you remember of going to Geraldton? Were you ever in primary school in Geraldton, or did you go straight to high school?

HH No. I went straight to the district high school and I spent three years there, which took me up to the intermediate university examination, then known as the junior.

RH And then you went back to Perth?

HH Went back to Perth.

RH The Geraldton work had finished presumably.

HH Oh no. My father remained there, but, you know, we were a split family. I had a brother working down here and the Geraldton work had a limited future, and again, my sister was working down here.

RH And so when you came down here you went straight to Perth Modern School.

HH Perth Modern School, yes.

RH That must have been quite a change from a country high school.



- HH It was. Modern School was a very fine school, a very friendly school, you know, with the school oval right next to it, within the grounds. And there was a football ground and a cricket pitch which you used with relish.
- RH I believe the sports side of the Perth Modern School was one of the highlights of your school period.
- HH Yes. We had some good sports people there. The Modern School, being a state school, was not involved with the sporting routine of the independent schools, but we used to play a lot of the adult teams which were playing Wednesday afternoon sports. And we brushed with some very noted sports people, particularly on the football ground, when we played teams like the Royal Australian Artillery, which composed of about half the members of the East Fremantle and South Fremantle football teams.
- RH They must have been pretty powerful opponents for a school team.
- HH Oh they were. I guess they took us a bit lightly but it was a great thrill and honour to play against people of their calibre, you know, international players. The Postal Institute was another group that we played against. We played against a couple of schools. We played Guildford Grammar, but we were much stronger than the independent schools at that time.
- RH Perhaps it was just as well for them that you weren't in the group then?
- HH Well, certainly. I suppose it came and went. In my first year there we were very strong, but in my last year we weren't. So it's the usual business. It's like the West Indies.
- RH Well that changes from match to match!
- HH That's right.
- RH What about teams like Aquinas and Scotch College.
- HH No. We didn't play them. Subsequently, I've learnt, from Kim Beasley actually, Kim Beasley Senior, who was an educationist, that the view was taken by the principals of those schools that secondary schools should be a private industry and shouldn't be conducted by the state. Anyway, they wouldn't play in sporting competitions [with Government schools]..
- RH So the schools were commercial rivals?
- HH Maybe, that could be an explanation. Yes.
- RH What about cricket? You played that during the summer.
- HH We did. And again, we had a very good competition. We not only played on the Wednesdays with the first eleven, but we also had what we then knew as the Saturday eleven, because having our own ground meant that we could have quite a menu of cricketing activities. We had a very keen master who was actually an A grade cricketer at the time, for Subiaco, and he encouraged everybody to play cricket. We probably would have had about 12 teams playing, either against outside, or within the organisation. We had



the Sahara Association and things like this playing on concrete wickets. The fortunate ones could play on turf.

RH What was his name?

HH Frank Pollard. He was a mathematics teacher, quite a competent one. We also had a French master who, I think, had played Gentlemen versus Players cricket in England. He was getting a little bit older and played with his pads rather than his bat!

RH Were you a batsman or a bowler?

HH Oh no. I was a wicket keeper.

RH Were you?

HH Yes, yes. Last man in in my first year, and the opening batsman in my last. It just shows you how the strengths of the teams varied from year to year.

RH Do you come from a sporting family?

HH Well yes, I suppose so. My brother was a very good sport. He'd been to Modern School, some seven years earlier to myself. He'd been a very good footballer, but had retired early with a bad knee. But I suppose we were fairly average.

RH Do you think going to a country school like Geraldton improved your sports?

HH No, I don't think so. No, it wasn't developed very well there. We used to go and have a cricket match on a Friday afternoon, or a paper chase, and, of course, we could swim. No, it wasn't as well organised there. When I was at Geraldton High the post primary section was fairly small, and a number of the children were leaving school at the age of 14. Remember this was right in the middle of the Depression.

RH It was an agricultural orientated high school.

HH Yes, it certainly was. We had a very limited selection of subjects. Science, for example, was limited to agricultural science. A good subject, of course, but I did find later on that I missed a grounding in chemistry, and I would like to have had a smattering of Latin. We had French, though, with a very good teacher too.

RH No chemistry at all Geraldton?

HH No. Not at that time. No.

RH Did you do any at Perth Mod?

HH No, I didn't do chemistry at Perth Mod. At Perth Mod, I was able to get into a sort of an in-between class where I was introduced to physics for the first time, and I was able to do applied mathematics and subjects like that. When I went to Modern School I found that my mathematics was quite up to the mark, because we had a good grounding at Geraldton school. We had some very fine teachers.

RH So your main academic interest was mathematics at Perth Modern.

HH Yes. I think that would be right.

RH When did you decide to go into engineering?

HH Well, as I mentioned, this was in the middle of the depression, and you couldn't be very choosy. Nothing looked very attractive at the time. Agriculture was in dire straits with wheat selling at about one shilling and eight pence a bushel, and there were no engineering consultants around. The only engineering that was available was through the Public Works Department or the Met Water Board. Not the Board, the Met Water Department, that's what it was then. And it was a case that things were so tight that you were encouraged to take a job wherever it offered, and then wait to see what came up later on.

RH You were a cadet later on, but you didn't become a cadet until you had actually gone to university.

HH No. Actually my first interest was to be a professional soldier. I wanted to go to Duntroon. But I had had a little bit of an accident with a toe and I was failed medically. I have often looked at that toe of mine and thanked it for releasing me from that career. Then I went school teaching for 10 weeks, but by that time I had applied for a cadetship with the Public Works Department, which had the attraction of course of indicating that there was a job at the end of the course. Although, had I known it, the last cadets that had been appointed, some seven or eight years earlier, completed their courses but were not classified as engineers. They were kept on as ex-cadets. Perhaps, if I had known that, I wouldn't have been so ready to have become one.

RH How long did they work as ex-cadets before they got classified as engineers?

HH I couldn't exactly say, but I think it was a matter of years.

RH And who were these ...

HH Oh, people like Don Munro and Frank Bottrell and Skip Foley and people like that.

RH Going back to Perth Modern School, did they have an army cadet unit there?

HH Yes. It wasn't much more than forming fours and marching around the oval. We didn't have rifles, and we didn't have camps or anything like that. We didn't have arms.

RH So it wasn't an introduction to the army.

HH No. I had been a cadet at the Fortress Artillery at Fremantle.

RH How old were you then?

HH Oh, I would have been about 16.



RH So it ignited your interest in the army.

HH Yes.

RH You went to UWA. You became a cadet shortly after?

HH Yes, well I was appointed just about the end of first term. I had been doing two subjects part time while I was teaching – well I was a monitor – and the university allowed me to continue full time in the second term with the three subjects that I hadn't commenced.

RH Was that chemistry?

HH {laughs} Oh no, not chemistry. No, we had English and Geology. Geology was the difficult one to pick up. And there was Engineering Drawing. Well, I had done Drawing at school.

RH When you were interviewed for your cadetship, who interviewed you?

HH {laughs} It was a very powerful triumvirate in those days. The chairman was the Public Service Commissioner, a chap by the name of George Simpson, at the time. And the Director of Works and Building was there, and the third member was the Dean of the Faculty of Engineering. So that on its own is proof that cadets weren't appointed very often in those days.

RH Were there any other ones appointed at the same time as you?

HH Oh yes. Cedric Poole was one. Cedric Poole was a little bit older. I think he was in his second or third year – second year at the university at that time -- and the third member that was appointed was David Bryden, who was a contemporary of mine at Modern School. So tight were things that students in their fourth year at the Engineering School applied for these cadetships. Obviously they weren't appointed, because they didn't want them as engineers as early as they would have become available.

RH So becoming a cadet meant that in all your holidays you had to work for the Public Works Department.

HH That's right. That was a requirement then. Well, the first requirement was that you qualified as an engineer at the university, and the second requirement was that before you went into the field you had to spend 12 months in the head office design branch, with the Engineering Department or the Met Water Supply Department or the Main Roads Department. So we got a sample of all three, not that we were much use, of course. At least we got the colour of the organisation.

RH How did you find that the people you worked with felt about having cadets in there?

HH Well, we were a little bit of a novelty, although they have had drafting cadets right through. But we were well received and people were very helpful.

RH This was in the Old Barracks building?



- HH In the Old Barracks. Yes. With the verandahs around the back - where everything was worked out.
- RH Were all the engineering departments in the barracks or were there some other premises?
- HH Yes, they were all there. The Main Roads were up on the top floor, or the third level. The Public Works was on the first and the second floors of the Barracks and there was a building which went off to what would be the north - that was a new building then. By the time I got there, the Water Supply Department had moved into that building. And then there were a few funny annexes where the accountant had his staff. It had a little bit of the colour of an army headquarters even then.
- RH When you were at university, was that on the Crawley Campus in the old building?
- HH Yes, yes. It was 1935 when I went there, but I had only been there a short time. You realise a few years have gone by when you walk through the grounds there now. Where there were small trees, there are now giants.
- RH Was that the Shenton House?
- HH Yes, the Engineering School. We really didn't have much to do with engineering other than Drawing in our first year, but it was in the second year when you had exposure to engineering subjects. We had our own boiler there and some steam engines. The equipment was rather poor. You had electrical gear that had been cast off from battleships that had gone out of commission. And it wasn't well organised. Although the library, as I recall it, was a combination of the Library of the Institution of Engineers and the University, but obviously there wasn't very much money available for that sort of thing at the time. The books were very old.
- RH Who were the outstanding teachers in the Engineering Faculty?
- HH The Dean at that time was Professor Blakey. No, he was a Mr Blakey at that time. He didn't even have an associate professorship. But he ran the Structural Department. The Mechanical Department was run by a very able Scottish mechanical engineer, who was doing some research on compression ignition engines
- RH Who was that?
- HH Andy Bowden. The electrical engineer was Professor Frankel, who was a Dane and rather hard to follow. And we had a hydraulics lecturer, a Mr Baldwin Wiseman, who was an Englishman and was essentially a research man, very interested in run-off prediction and rainfall records and that sort of thing. He often used to tell us that he had been an officer of the navy, the army and the air force. Obviously, he had done research in England in those areas.
- RH How did your interest develop - into structures or hydraulics or what?
- HH The civil was not very well developed at the university and I was aware of this because I was seeing some civil at the Public Works, Main Roads and

the Water Corp. I guess I was much more interested in structural engineering than the other subjects. I didn't mention surveying of course. We had an experienced surveyor in George Nunn.

RH Blakey was an outstanding structural engineer, wasn't he?

HH He had his job which carried with it the right to private practice, and if there ever was a big building to be built in Perth, it would go to Blakey.

RH Were there any other private consultants?

HH No, I would say not. After I graduated, I remembered two names in the structural field in Don Fraser and Len Cutts. But, no, I think they sort of rotated from a little bit of private work and the building surveyor's position at the Perth City Council.

RH Were they both building surveyors – Fraser and Cutts?

HH From time to time, yes.

RH Otherwise, all the engineering was done by the government departments.

HH Yes, except for the mining of course. We weren't very much involved with mining. Mining at that time was being revived, and once again, it really took Western Australia out of the Depression. Those were the days of de Bernales, and there were quite a few American engineers up there.

RH Mining was originally included in the engineering faculty wasn't it?

HH Yes. Well the Vice-Chancellor was Professor Hubert Whitfeld and he was a mining engineer. Quite a few of the models around the place were of mines, but we didn't have any lectures in mining. Although we did get occasional lectures in military engineering and railway engineering, but anything on any other civil subjects, well, Blakey would handle those, but his expertise was in the structures.

RH So, for the railway lectures and ones on military engineering, outside experts were called in.

HH That's right. And they were only half units and sometimes the half unit in turn was divided into two quarters.

RH How did your sporting interests fit in with the university life?

HH I played some rugby there. I had played A grade rugby while at school. I used to play with Cottesloe. But ...

RH At Perth Modern, you played rugby?

HH No, we played football. Yes. I played cricket with the university first eleven. But I had a little bit of an injury which kept me out of both sports for a year. When I renewed football, I went back to the Australian Rules, which I think I preferred, although I was probably better cut out physically for the rugby game.

RH What position did you play in rugby?



HH I used to play front line forward. Yes.

RH What did you get your blue in?

HH Football.

RH Which year was that in your university?

HH Oh, it would have been about '38.

RH What do you have to do to qualify for blue?

HH At that time we used to recognise it as a half-blue for football. To get a full blue in football you had to play for the state side, and I was never in that class. But I think there would be about three or four players who would get a half-blue in football each year. And cricket, I had to drop that, because as a cadet I was out in the country over the wrong season.

RH And did you used to play interstate universities in football?

HH No, I don't think so. There was an Australian universities team which went up to Singapore at about that time. I remember Alan Robertson went, but that would have been a little bit after my time in the game, it would have been about 38 or 39 – 38 probably.

RH Was that any relation to Austin Robertson?

HH No. Alan Robertson became the chief engineer of the Melbourne Board of Works. He was a West Australian, and a friend of mine actually.

RH Whom did the university mainly play?

HH It played in the amateur league. There were a few district teams, like Wembley, but you'd also have teams like the Postal Institute and Harris Scarfe, and Sandovers was a great sporting firm. But it was really at a transition stage. Post war, I would think, it became probably more district football, and at a much higher standard too, because the coaching perhaps was a little bit more intense. Again the numbers were much different postwar to what they were then.

RH The amateur league didn't have the reserve teams from the professional teams such as East Fremantle playing in it?

HH No, no. It was very much amateurish.

RH The whole time you were at university, you lived at home, at Cottesloe?

HH I did, yes.

RH Did you go to university by train or bus?

HH The bus, yes.

RH Was there a sort of a separation between the guys who lived in college at university and the guys who went there daily?



- HH No, no. The syllabus was rather full at university. You know, in second and third year, you'd spend your day from nine until five. It was only in the last four terms that you had a little bit of leisure.
- RH Yes. It is always the way in engineering courses.
- HH Particularly if you do subjects like geology, which involved doing a lot of laboratory work.
- RH At the end of the third year and the beginning of the fourth, you had to do some practical work, is that correct?
- HH This is right. We finished at university at the end of the second term of third year and we wouldn't resume until the second term of fourth, and this was the big chance to get a little bit of practical experience. Some people took advantage of the break to work in organisations like BHP at Newcastle, while others found employment here with Public Works or the Main Roads.
- RH You had spent your period in the drawing office by now, and you were sent out on the field, were you?
- HH Yes, that's right. Dave Bryden and I were allotted to the hydraulic engineer. At that time there was some controversy in the irrigation districts, with farmers saying they weren't getting enough water, and the Department saying they were using too much. But this was a great opportunity to actually measure the water that was going on to a property and, where drainage was installed, we could also measure what was coming off. We had these portable venturi flumes which we used to take around on the back of a utility.
- RH What did they look like and what did they do?
- HH Oh well, the beauty of the flume was that it didn't take up a great deal of weight. In effect, it was a broad-crested weir, and the throat would be about 12 or 15 inches wide.
- RH A sort of V shape?
- HH No, no. A flat, broad crest. And it had to be located in a position so that you could control the flow to the highest part of the property and still maintain the standing wave. Then later we had clocks on these to drive drums, and on that we'd produce a graph of time on the abscissa and head on the vertical. You could work out then just how much water had gone on. And you'd be very surprised just how much did go on.
- RH When you talk about standing wave, what was that? What does that look like as it went over the weir or flume?
- HH Well, the water level immediately below the flume was lower than it was in the channel as it drained, as it came away, and it ensured that it was operating as a broad-crested weir without interference of the tail water. We'd install these in the farmer's head ditch just inside the property.
- RH How do they measure how much water went into properties if they didn't have this sort of measurement before?

- HH They didn't. It was all very much in the judgement of the waterman. They had these flumes, large size concrete flumes to send quantities of water into particular districts. The whole system was zoned so that the watering would be conducted zone by zone. The watermen were very, very skilled, and it was astonishing really what they did. The old foreman down there, Dave Byass, he just had to look at land and he'd know what could be commanded and what couldn't be commanded. Of course, this was before graders were introduced to grade the land to a more favourable level. It was all furrow irrigation at that time and, of course, irrigation was used for stock water too.
- RH And most of it was for growing fruit, was it?
- HH No, a mixture. In the very first area that was developed – that's in the block really following the line of Uduc Creek which was the first settled portion - I think it's First Street, Second Street, up to about Eighth Street - this was developed for citrus. This is where they had troubles in the early days with the waterlogging because it was an area which was between two creeks, and therefore the soil was very clayey and you didn't get a good penetration. And when it waterlogged, tiled drains were put in, and this is where we were measuring what was coming off. But for the rest of the area, it was very much whole milk production.
- RH That was one of the success stories of the 1930s – increased milk production in those areas.
- HH That's right. It was one of the few profitable areas of agriculture at the time, because wheat farming was pretty unattractive. But the milk supply was very much regulated. A good farmer who attended carefully to his pastures was able to improve his herd and get pretty good return.
- RH Okay, we are back to Harvey again, Harold.
- HH Yes
- RH How did you get down there when you were sent down? Did you go down by train, or did they have department vehicles?
- HH As a cadet, you mean?
- RH Yes.
- HH You'd go down by train. Yes, that would be right. There would be a couple of trains running each day down there. One was to bring the milk back.
- RH And you stayed in tents, did you?
- HH We did, yes. Just about at the site of the current High School down at Harvey. And Lou Park was in a tent with his family just nearby.
- RH Family as well.
- HH Yes, yes.
- RH How many months did you spend down there?



HH Oh well, we went down quite a few times actually. We also did some leakage tests on some of the channels. The channels weren't lined at the time, So we did the break between third and fourth year and we even went down there for the May holidays to check on some of these channels. But it wouldn't have been until I was in my final year when I had completed the 12 months in the drawing office, as it takes a fair time to knock up a whole year. I would have been in my final year when I was allocated to the Hydraulic Engineer and I worked in head office, assisting the engineers designing channels, irrigation channels, and drains, while at night I was working on my thesis down at the university. And when that was completed, I was allocated to the field. This was a time of great change in the organisation, because the two dams that were being constructed by the Hydraulic Engineer's Branch, the Samson Brook Dam at Waroona, and the Stirling Dam at Harvey, had been under the direction of the Hydraulic Engineer, but the responsibility at that time was passed over to Mr Dumas, who was the Engineer for Metropolitan Water Supply, Sewerage and Drainage, and I was transferred from the Hydraulic Engineer's Branch. No, I would have stayed in the Hydraulic Engineer's Branch, I guess, but I had to report to Mr Dumas and I was to go down to Stirling Dam.

RH This would be in the end of 1940, would it?

HH Well, let's see. When I went down there it was the very first months of the war. It was in 1939; towards the end of '39.

RH So the last thing you did at the university was complete your thesis. You did that in your fourth year.

HH Well, part in fourth year and part in fifth year.

RH What was the thesis on?

HH 'The permeability of concrete'.

### **End of Side 1, Tape 1**

### **Side 2, Tape 1**

RH Did this result in you being considered a concrete specialist?

HH Not really. Oh well it was an introduction to concrete. I became more involved when I got down to Stirling Dam and shortly afterwards too. Even from Stirling, I used to go over to Samson Brook with Victor Munt on concreting days. I had a function to perform there, keeping an eye on the concrete mix, and things like that, and Victor introduced me into the methods of the Bureau of Reclamation as we drove from Stirling Dam to Samson. These were quite new to the Public Works Department at that time.

RH So he had been on a tour of the US?

HH Yes. He'd been there a year or two earlier at a period when Canning Dam was closed down because of a shortage of funds, I think. He went to America – at his own expense, too, as I recall – and made contact with the Bureau of Reclamation and was very impressed by their methods. Of



course, he was receptive because he was working on a dam – the Canning Dam.

RH Your first time into the field as a graduate was at Stirling Dam.

HH Yes

RH What work were you doing at Stirling?

HH Well, it was early days at Stirling. We were just setting up the buildings. The office was under construction. The store was under construction. The house for the resident engineer was being built, and we were chopping, chopping. We were clearing the site of the dam and grubbing that out, and we'd made a start on the core trench. I hadn't been there very long when I was told by Mr Munt that I would be starting work at midnight on the Sunday – this was Friday. We were starting three shift work on the Stirling tunnel.

RH This is a diversion tunnel.

HH Yes, a diversion tunnel. It was 13 feet in diameter. It was quite a decent structure and it was about 1100 feet long. That was quite an introduction and quite a responsibility.

RH For someone straight out of university.

HH That's right. The method of, I suppose, Mr Dumas, and certainly of Mr Munt, and the way Canning Dam was run, and the rest of it, was that an engineer in his early days had to behave more like a ganger, because we always sort of started with the 'blow up' with the men and the 7 o'clock start. I really had a hectic time when we started that tunnel, [because, you know, when you are doing three shift work, the progress achieved in 24 hours is the equivalent of three days of single shifts. This impacts not only on progress but also on the time available to deal with problems arising. A single supervisor has to contact each shift daily.] I recall going home for my Christmas holidays dead beat.

RH And this is a rock tunnel.

HH It was rock, although it was very difficult country getting into it. It was decomposed and we had what the miners used to call soapy headings. I was just learning the techniques of making the back of the tunnel safe. We had some bent rails which we fitted in to support the rock. Then we used to slip timber sheeting from rail to rail to hold the thing up. Oh it was difficult country, until we got onto hard rock. But then it was a question of keeping the tunnel on line, but more perhaps the pressure was to get production. And it didn't come easily, because we didn't have experienced people.

RH All the best miners were on the gold mines, I suppose.

HH Oh, anybody who was a machine miner would have been on the gold mines and the one or two people who had had some experience were people who had been 'dusted'. But we very fortunately got onto a man who was made a foreman, a Bill Smith, who was good, and he really took most of the load off my shoulders. But, unfortunately, shortly after that, I was transferred over to Samson Brook to do to the tunnel over there.



- RH Oh you were obviously labeled as a tunnel man!
- HH Well, because the tunnel man over there, Cedric Poole, who, again, was one of our vintage of cadets, had been involved in a motor accident, and because Frank Bottrell had only just moved in as the replacement resident engineer, due to the changeover. He had plenty to worry about without having to fiddle with three shift work in a tunnel. Because even on things like the core trench we were working on a two shift basis, as when Mr Dumas took it over, he made certain that all the activities were labour intensive. So, instead of having hoists to pull the bucket up from the bottom of the trench, it was all done by hand windlass. We had a terrific labour force for a small dam like that. At the peak we had 600 men on the site.
- RH This was Samson Brook?
- HH Yes. Employing labour was just about as important as getting the job done. The sort of decisions that were made in order to employ labour included having dray borrow pits when we came to building the bank, where we had 50 drays and each dray had its driver and its swamper. So there were a 100 men producing so little.
- RH Compaction was done by horses?
- HH It was along the core. The core was concrete up to the natural surface, or perhaps three feet above natural surface and that was a concrete wall three feet wide. On either side of that there was a very sticky pug, and that was watered so that it could be compacted, sometimes by hand and sometimes by walking a horse over it. But when we came to build the bank, of course, we did have sheeps foot rollers. It was in the course of that work, just as we were starting on the bank in the second year, that we got a bulldozer. This was the first time we'd seen bulldozers. We had steam excavators, of course, but the bulldozer was very valuable in putting in approach paths from the excavators down to the various levels of the bank. All of that had previously been done by hand. You'd have a gang working for a week, and the bulldozer came along and just pushed straight through it. We also had small tractors pulling the sheeps foot rollers, but they were only light rollers.
- RH So they weren't horse drawn, a lot of those. There were a few tractors to do that.
- HH Yes, yes. You had this mixture of motor trucks and drays on the bank. The drays, incidentally were only there on the day shift. The core concreting and earth placing was a two shift operation. The steam excavators – one was a comparatively small one with about a 7/8 yard bucket, and the other had a yard and a half bucket -- they had boilers fuelled by timber, and that came from the clearing. You very quickly learnt that you needed good timber for that, good dry timber, if you wanted to maintain your output from the excavators. But they were old machines, and it was always an adventure when you had to shift one from one position in a pit into another, because it was even money that the tracks would break in the process, or you would break some wopping big casting.
- RH They were only used in borrow pits for digging out materials that went onto the dam?



- HH That's right. Of course we had to produce our own power, although the only power we produced was compressed air. There was one very small lighting plant which did no more than light up the boiler house and the office and the resident engineer's house. Otherwise, in the tunnel, we worked with acetylene lamps.
- RH All the drills were operated by compressed air?
- HH All by compressed air, and we had a tool sharpener on each shift. This was quite a problem because the tool sharpener had to have the right heating to heat the steel to the precise temperature before he tackled the tip. [The incident light affected the colour of the heated steel in the drill sharpening process.] On the first shift of the week it was chaotic, because the temperatures were all wrong. We eventually got around this by getting some salts from the steel manufacturers to apply so that we could reconcile colour with temperature. Then we were able to translate that to colour and work from there. But then of course I gained from the experience of the operators of the drifter machines. These drifters were a very powerful machines. They were mounted on a horizontal bar and if the operator wasn't skillful, he'd get them out of line and he'd break the shank of the drill. Oh, we had troubles of all sorts. Of course, we didn't have [to pump] water inflow as we didn't have much inflow there. We used to take the mullock out by hand loading on to a flat top Chevrolet - like vehicle which had been stripped down to go into the tunnel. But this meant that we were taking petrol fumes in there.
- RH Did you have much ventilation?
- HH We had our air supply being blown in and we had the usual canvas hoses which went right up to the face. We were using a drag cut. The procedure would be to load the drag cut, and to place steel plates down so that when the rock was excavated, it fell on these steel plates which made it easier for men to shovel it up.
- RH Why is it called a drag cut?
- HH Because it dragged the toe out. The first holes to be fired were those that first of all relieved the main drag. The main drag was a hole drilled at an angle of about 50 degrees or something like that and it terminated just beyond the level of the tunnel, four feet in. We were doing a four foot cut. First of all you drove a smaller tunnel through. It was about an eight foot width and about eight foot high. Then you would have another group following up stoping the rest of the excavation down. That was easier because you had a free surface to fire to.
- RH Did you have to have scaffold or shield to drill from?
- HH No, [not for the eight foot by eight foot tunnel.]. They had this bar which would have been about at shoulder height – or a little less than shoulder height. The machine was clamped on to that and then you moved it in the plane of the tunnel direction and from side to side. So there would be three series of holes.
- RH So this was ---- in 1940 at Samson Brook, was it? We are coming on to 1941 now.

- HH Yes, when the bank was built, I think it was 41. Yes, 41. That's right, in 1940 we were completing the excavation .
- RH Victor Munt was a sort of, what you would call an inspecting engineer, senior to the resident engineers?
- HH Yes, he was senior to the resident engineers. Dumas himself would visit both of these dams once a week. He'd spend a day on one dam and a day on the second. He insisted on passing any foundation, personally. So it was an extraordinary commitment from a man who was also running a very substantial sewerage programme in Perth.
- RH And these weren't part of the Metropolitan Water Supply works at all, they were Public Works Department works originally.
- HH That's right. Yes.
- RH Who were the resident engineers at that stage, then?
- HH Under the Hydraulic Engineer, John Gillespie was at Samson Brook. John Gillespie had just about come there from a very successful tour down at Esperance Harbour, where he had built the jetty there. Lou Park was the resident engineer at Stirling, and he in turn had had charge of a fairly major work, the Harvey River diversion, which went through Myalup. They had had some tremendously big excavators there. There was also a lot of hand work.
- RH That was where there were a lot of men doing sustenance work during the Depression.
- HH They were working for very short periods.
- RH Very labour intensive ...
- HH Both Samson Brook and Stirling were run on this basis too. Although very soon after the tunnel started those men that worked on the tunnel were placed on full time, because that work was a little bit too specialised to have people changing. But otherwise, the foreman spent his Friday afternoon going around the site and rearranging his gangs for the following week, which was a very substantial task. especially when you get 600 men on the job.
- RH What did the men do when they had their days off?
- HH They used to get a ticket home.
- RH Did they?
- HH Yes, by train. Most of them were cooking their own meals and you had all sorts of complications with new employees signing procuration orders in favour of the local grocer. So if somebody was dismissed, or resigned, or anything like that, the office staff had to be in touch with the grocer in the town of Waroona or Harvey to find out what was on his account so that it could be deducted from his wages, because they used to get them to sign these procuration orders as soon as they came onto the job. At Samson Brook, there were quite a few married people living in tents, and in time, due



to some very unfortunate incidents, we found it was necessary to provide for an infant health sister to come up from Waroona for a day a week, or at least half a day, to give mothers assistance there.

RH Some of the infants became ill?

HH There were a few cases of that, yes. There was also a boarding house on the site, so the men didn't all batch. However, the biggest majority were batching and people had these little fires outside their tents and the tents were awfully crude. A man got a six by eight foot tent and he was issued with a palliasse and some straw and that was all. He was given half a day to rig his tent and prepare his palliasse and they usually used to make up rough and tumble beds.

RH What sort of accommodation did you live in?

HH Oh, we were favoured. We had ten by twelve tents.

RH Wow.

HH Yes. And what's more, they were on a T&G floor. And we had a mess, with an ex-Royal Navy chef, or cook as we would call him. Of course, being the senior engineer around the place, I copped the job as mess secretary. I was very good at buying cheese and butter and sugar. I still remember the prices, because you had to keep them. You had to work out what each meal cost and people paid according to the number of meals that they had.

RH Good for your accountancy.

HH That's right. Yes, that's right. Our mess was a pretty mixed group. You'd have a few arguments arise, but generally they were few. You know a lot of the men on the staff were real characters. You'd meet people who knew John Forrest and people with similar stories. They would tell you of some of the colourful events and personalities of the turn of the century. And, of course, we had also quite a few returned soldiers from the 14-18 war. I always thought that the war experiences of engineering staff in the Public Works and, I guess, the Metropolitan too, had a great influence on the way these camps were run. You know, even the terms – the mess and so on – came from the army.

RH They were all dry camps, were they?

HH Oh yes. Yes, a fellow used to produce some pretty rough wine a few miles down the track, and that created a little bit of noise. But, yes, they were dry and, of course, we were twelve miles out of the towns and, besides, nobody had much money in the depression years. In the mess, we would have a mess party every so often where we would get a keg of beer in. It was a tradition that was always carried on.

RH During this time you weren't eligible to join the army, because you were in a reserve occupation.

HH Yes, it was a reserved occupation. There'd been call up for militia training and because of that I had to go down for a medical exam. But my occupation was a reserved one, and it wasn't until Samson Brook was

completed, and I'd returned to Stirling, that I was released by the department to go into the services. We were all anxious to join up because our friends had and my brother was overseas at the time.

RH Yes. Did your brother or your sisters go to university?

HH Yes. My brother did go to university part time. And [the younger of my sisters] went there part time for a while, and all three of us went to Modern School. But my brother didn't go on beyond his junior – he didn't want to stay at school. He joined a bank. My sister went to Modern School from a junior school and then went to Geraldton High School with us, and she got her leaving. She was one of the first five to get her leaving from Geraldton.

RH That's quite an achievement.

HH Yes. They were the first candidates that the school put up. They didn't get 100% passes but they did pretty well.

RH What was your first move to go into the army?

HH Well I'd indicated my interest and I'd been told that the way to get into the AIF was to come into the full time militia and then to transfer over as a vacancy occurred. Eventually I was called up and occupied the very impressive posting of Assistant Inspector of Armourers.

RH of Armourers?

HH Yes. I went into camp at the ordinance depot at Midland Junction. I was only there a few weeks and went down to be introduced to a Light Aid Detachment.

RH So this is in the Electrical and Mechanical Engineers?

HH Electrical and Mechanical, yes.

RH Why did you join those rather than the Engineers?

HH Well, how silly you can be! The army was recruiting architects to become engineers and you know architects were learning a bit about explosives and things like that. Practically all the people who were inducted into the CEME were either mining engineers or civil engineers. And I could name a long string of them, including a lot of my friends, and of course that was an incentive to go over. Gordon Barrett-Hill was a name that you'd know. He was one that had gone in quite early but he very quickly got into the armoured division. Most of them got into the armoured division but not all.

RH Where was your first posting ?

HH We were camped at Melville at that time. It was the 13<sup>th</sup> Brigade. I spent a little bit of time with the LAD at Brigade Headquarters and a little bit of time with an LAD with the signallers.

RH What does LAD stand for?



- HH Light Aid Detachment. Light to the extent that the craftsmen – that was what mechanics were called – didn't immobilise equipment for any length of time because they realised that the war had to be fluid.
- RH So they just kept it on the road, Harold.
- HH Yes, but they were pretty capable boys [laughs]. They were able to do substantial work. With each level of the formation you'd have these mechanical sections with the people in the field – the artillery and the Royal Australian Engineers – they all had LADs. Then larger repair work – and it was mostly motor vehicles- would go back to what you would call a brigade workshop. They were a little bit further back in the line and then from there they would go, in the case of an armoured division, to a third line – the armoured troops workshop, where they could do fairly substantial work. But where stuff had to be rebuilt, that went back to the base. This was the way it was all organised.
- RH So an LAD could be attached to any type of organisation?
- HH No. There was a definite order of battle. You had an LAD with each infantry brigade. You had one with each artillery regiment. You had one with each RAE organisation in the division, and the RAE had up to three field companies and a field park. There was one attached to the divisional signallers, one with anti-tank, which later became known as tank attack because it sounded much more aggressive. {laughter}
- RH So with your first LAD, Harold, where was that?
- HH Well, I was introduced to LADs in the camp at Melville for a period of four to six weeks, and then when the Japs entered the war, invasion was a risk in Western Australia. A vulnerable point was seen as Jurien Bay, because that had been used, I think, by the Japanese whaling fleets, or the like. The area, of course, was very inaccessible at that time from the land.
- RH It had deep water close to land?
- HH Yes, I think it did, or comparably deep water. They knew the coast well. A special mobile force was set up so that one infantry battalion, the 44<sup>th</sup>, was fully equipped at the expense of the other three, because the equipment was very much at a premium at this time. That battalion was the nucleus of a Special Mobile Force, which was organised like a miniature brigade group in so far as it had a small section, or battery, of artillery, and it had a section of anti-tank, or tank attack, guns, and it had a section of Royal Australian Engineers, and so on down the list. My LAD at the time was the one that was chosen to go into the field with this group. It was remarkably good training, because the CO had had a fair bit of experience, he was a First War man, but unfortunately it was in the medical corps (laughter). But nevertheless, he was a good training general, and a pretty haughty sort of an individual, and he [laughs] put us through the hoops! And we had a short time at Bushmead getting together and being knocked into shape. We had a well known army personality who gave the troops special training in unarmed combat and all of this sort of thing, Reg McKissock. Then we went into the field. We went to Moora, which was the nearest point to Jurien Bay, and then we went up to Mingenew. By this time, the 3<sup>rd</sup> Corps was being established in Western Australia, under Commander General Gordon



Bennett. There were two infantry divisions, and the armoured div, under General Robertson, came out. By this time we'd served our purpose as being first targets for the enemy.

RH You'd kept the Japanese away.

HH We kept them away, yes! And then I was transferred to another LAD. First of all, we were LAD Corps troops, and we had a short period with the Light Horse who not only had real horses but also machine gun carriers and that sort of thing. From there, we became the LAD attached to the 2<sup>nd</sup> Division, and we were at one of the Grant's properties out from Geraldton, Moonyoonooka. From there I got transferred to another LAD, one which was attached to the Royal Australian Engineers, which was a happier group than I had ever struck. I was with them for some months. I remember the Greenough River coming down in flood one day during one summer. We had a swimming pool at the bottom of our camp and the drill was to go out running in the morning and do a run, and then break off just at the swimming pool. Those that were ready for a swim could have one and the others could troop home to the camp. It was after some months there that the establishment of the Division Headquarters had a minor amendment in it to the effect that an adjutant EME would be added to the headquarters to assist the Commander of Electrical and Mechanical Engineers in the division, and I was appointed there. Once again, in true army fashion, of course, it was from scratch. We didn't have a course in it, but we learnt by doing. Again, it was educational, and you were with a different group of people, people who were staff people, who were involved in preparing movement orders. You also had your general staff people who were concerned in producing battle plans, and things like that.

After a period with that group, I became an adjutant EME. The army was diminishing by that time. Only just beginning to diminish. I was transferred to Three Corps headquarters where I was the adjutant EME to Colonel Milner, who was a very senior engineer. He wasn't a Duntroon graduate. He joined the army some years before the war, but he was a trained mechanical engineer. I remained with him until the Corps was broken up and became a Command, and I went over to the Command as an adjutant EME.

RH Where were you stationed then – when you were with Colonel Milner?

HH We were stationed, again, very close to here, over at Graylands. There was a military camp there.

RH And he had quite an influence on you, didn't he?

HH Oh yes. Because I was very young. I think, at that time, you are more influenced by people than you are later on. He had an ability to get things done. He was a fairly erratic sort of a man, but very direct, and quite experienced in mechanical engineering, which, of course, I was not. We got on well. This was the time when we were selecting people to join the SRG, the Services Reconnaissance Group, which did the raid on Singapore. I remember when the Queen Mother's brother – I suppose it was her brother – Colonel Lyons, came here. I know that I had to clear everybody out from the vicinity, so that the Colonel could talk to this Colonel Lyons in his office. It was so secret that nobody was allowed to hear. There was also a Commander Branson. He, again, was a cloak and dagger type. That was



one of the things that we were doing then. Of course, by this time, the organisation was fairly complete. Nungarin had been established as a base workshop.

RH It seems a long way into Western Australia, Nungarin? Was that why it was chosen?

HH Yes, it was well served by rail. You could have one rail knocked out and you could come in another way. When that mobile force was first established, there was every expectation of an invasion. I know a lot of the senior people were exploring the possibility of sending their families into the Great Southern, and places like that, to be away from hostilities. And, of course, the big problem there was that you couldn't send a great number of people there because the water supply was deficient. So it was casting shadows.

RH You could send them to Kalgoorlie, though.

HH {Laughs} Well, once again, there were problems there. There were special little diesel plants dotted around to take over when the steam plants were knocked out. And, of course, if the pipeline itself got knocked out, then that was a job for the local repair groups.

That was about my army time in Western Australia. It was about then that Colonel Alan Milner got me a posting with a Queensland unit. I was going into the brigade workshop group. I went in as 2i/c of the 102 Brigade Workshops, which was servicing an independent brigade at Bougainville.

#### **End of Side B, Tape 1**

#### **Side A, Tape 2**

HH The Americans had landed at Torokina, Bougainville, and had set up a perimeter, and left it at that. The Australian troops came in to do the mopping up with a division, the 3<sup>rd</sup> Division under General Savage, opposed to a superior Japanese force. My particular independent brigade was given the job of following the Japanese up the coastal section, northwards up to the vicinity of Buka Island, and then coming down the other side, because the centre part was very much high land. This was one way of engaging these people and keeping them out of the battles at the bottom of the island. The infantry had moved up the coast a little bit, and it was decided to send an advance section of the workshop up to be in close support of the infantry. I went up there to command that advance workshop section. I remember getting up there and hacking an area out of the jungle, the area that we'd had allocated to us by Brigade. No sooner had we finished than they had a change of plan and they decided that it would be a very good place for landing stores from the Douglasses. They then allocated us another one and we had to turn around and clear another section of the jungle.

I wasn't there a very long time before I got a transfer, again as adjutant EME. By this time I was a pretty senior adjutant.

RH What were you, a captain then?

HH Oh, a captain from a long time back, yes. It was all very much a seniority business. I would have been a captain after being in the army about a year.



And I was transferred to the 6<sup>th</sup> Division as adjutant EME. The 6<sup>th</sup> Division was doing the push on the north of New Guinea from Aitape to Wewak and beyond, with one section doing the inland movement and the other the coastal movement. By the time that I arrived, Wewak had been taken. There had been a landing at Wewak and I went down in a landing craft and came into Wewak. Our location was right on the point at Wewak, which wasn't so far behind the infantry at the time. You could watch the RAAF come in and bomb the positions. Wewak had been a very big base for the Americans then. There was a huge area of wrecked planes. The Americans had come in early one morning with the advantage of a mist, and you didn't get too many mists on the coast, but they just got this one. The mist lifted just as they got there, and they were able to catch all of these planes on the ground.

So, while I was there at the divisional headquarters, a vacancy occurred with the LAD attached to the artillery. This, of course, had the advantage of my doing just about the full gambit of LADs. I went down there to the 2<sup>nd</sup>/3<sup>rd</sup> Field Regiment, which was a very good appointment. They were a very good group. They were half South Australians, half West Australians. Of course, I had known the 3<sup>rd</sup> Field Regiment, which was the original militia unit from the Special Mobile Force, although this was a different unit of course. This was the 2<sup>nd</sup>/3<sup>rd</sup>. And I was there when the war ended, and to my delight, the Director of Works and Buildings applied to the army for accelerated release of all Public Works engineers who were in the army. And it worked, and I was home by December 1945. Reported to the Public Works, and said, I want some leave!

RH So did you get a ship from Wewak down to Queensland.

HH Yes. We came down by ship from Wewak. We clambered up rope nets to get on board the ship, the *Duntroon*.

RH Oh yes.

HH And by this time of course, I had a Japanese officer's sword [laughs]. I had that dangling over one shoulder and the kit bag over the other as I was trying to get up the rope ladder. But I would have got on board that ship, no matter what I was carrying. And home we came to Brisbane, and then to the Showgrounds, and then priority transport home. I joined the plane and discovered that Mick Driver, from the Public Works Department, was on the same route. We came on the plane and had a good night at Parafield Aerodrome in South Australia on the way home, and then arrived in Perth in the morning.

RH Previously, you'd got married, I believe. Wasn't it in 1944?

HH 1944, before I went overseas. Yes. I was married in September 1944 [to Elizabeth Braimbridge].

RH I think you said she was a nurse.

HH My wife was a very busy girl. By that time, she had charge of the operating theatre at the Mount Hospital, which was one of the major private hospitals at the time. She was very busy, always on call. She was glad to see the war end too, because she had had enough.



- RH Was she a Perth Mod student?
- HH No, no. She went into training at the Children Hospital at a very youthful age. When the Mount Hospital was being reorganised, she was called in and was told that they were establishing a children's ward at the Mount Hospital and that they also wanted somebody to go into the theatre to assist the person who was then in charge. My wife said that the Matron turned to the other girl and said: 'well, you've had children's experience, so you go to the children's'. But she had got it the wrong way round [laughs]. But my wife occupied that pretty important job for some years.
- RH So when were your two sons born?
- HH The first one[Maxwell]was born in October 1946 and then the second son [Gregory] was born in 1949.
- RH When you came back to Perth, was it a bit different to when you left? Was the Public Works different?
- HH Well, it was, but I don't know that it was that much changed. There were a lot of infrastructure problems around the place. It was the devil's own job to get a phone call out, and you couldn't buy anything.
- RH Construction material was short.
- HH And the power station was overloaded, as there had been no opportunity to upgrade it during the war years. The railways were run down, because they had done a lot of work moving troops around, and everything was a problem. The road system had been neglected, because the efforts of Main Roads had been put into temporary aerodromes around the metropolitan area and up in the north. You certainly couldn't buy timber, and there was a housing shortage. It was a postwar Perth.
- RH What was the first job you went on to when you came back?
- HH Well, I had a year assisting Don Munro in designing the plant for Mundaring Weir, which was very much a question of adapting what we had. There was all the equipment from Canning Dam, which had been stored in Perth over the war years, which gave us conveyors and screens, and things like that, and some pretty worn out crushers. But, with a few minor purchases, we got that plant designed. We ordered secondary crushers – Traylor one foot eight [diameter]. And we ordered a bigger concrete mixer. We got a two cubic yard concrete mixer and it was decided to acquire a concrete pump which was the largest size that you could buy. It pumped three inch aggregate.
- RH Was that the first one which the Public Works had had?
- HH Oh yes. It was the first one in Australia. Yes.
- RH Where did you get that idea from, to pump in concrete?
- HH Well, I think it was a case of there wasn't a great deal of concrete involved in the structure; it was just a little over 80,000 cubic yards and this would have made alternatives fairly expensive for that small amount of concrete. It was only about a fifth of the amount of concrete that had gone into the Canning

Dam, although there was a job to follow down at Wellington. But I think people were very impressed by the rate at which this pump could deliver, because we were told that it could pump up to 60 cubic yards an hour, and that was a lot of concrete. While we didn't get quite that much, we got some pretty high deliveries under favourable circumstances.

RH Did it come from America?

HH It came from Milwaukee, yes. And I remember there was a great battle over paying customs for it. It was very cheap piece of plant. It cost us £12,000. The customs duty that was proposed was £6,000, or something like that. I think we overcame that because there was a procedure whereby manufacturers could appeal and it was pretty hard to appeal when they hadn't made one, or didn't have one available. So I think we got our £6,000.

RH And raising Mundaring Weir, what was the idea behind that? What was the water supply required for?

HH Yes, well, I go back a little bit. In about 1937 the government formed a committee of three of its engineers to consider a water supply plan to pump water back into the wheatbelt, and perhaps to maybe also make more available for the goldfields. I suspect this might have been the brainchild of one of the up and coming hydraulic engineers, Cyril Dimond. The committee that was formed consisted of – I am not sure who was the chairman- but the three members were R. J. Dumas, who was the Metropolitan Water Supply Chief Engineer; a Mr Waller, who was the Engineer for Goldfields Water Supply and who, incidentally, had been a cadet on the original Mundaring scheme and the third was Bernard Santo Crimp.

RH The Hydraulic Engineer.

HH Hydraulic Engineer. And they came up with a majority decision, and the majority decision was to dam the Dandalup and pump the water back from there, and the minority recommendation was that of Mr Dumas, which was to raise Mundaring and to raise Wellington. And, of course, by this time [1945], Mr Dumas was the Director of Works and Building, and I guess it was a case of 'as three pips are to two, I'm right'!

During the war years, there had been shortages on the Kalgoorlie supply and a link main had been laid to convey water from Canning Dam [via a pump in the Helena River] into Mundaring Weir. It could well have been that Mundaring Weir could have had some very dry years, in about 44, because thereafter it had some very, very, wet years, 45, 46, and 47.

Of course this introduced problems of how to raise a dam. Mundaring had been very capably designed by the C.Y. O'Connor team, but the state of the art had progressed over the years and it was appreciated that the provisions for uplift was considered to be far too little for such a dam.

RH This is when uplift is caused by water seeping underneath the dam?

HH That's right, yes, and it was no where near the sort of uplift that was then being allowed by the Bureau of Reclamation. And quite clearly the uplift was there because at one stage, back in the 20s, some diamond drill holes had been put back into the concrete of Mundaring and indicated quite an uplift.



- RH And were their concerns about putting some extra weight on the dam when they weren't quite sure about the strength of it?
- HH The fundamental problem was to provide additional mass in the concrete broadly to satisfy the middle third rule.
- RH The middle third rule being what?
- HH That is a rule that indicates that the combination of the weight of the concrete and the thrust of the water impounded, and silt if that applies, should fall within the middle third of the dam. When this is within the middle third, the concrete is not put into tension. The whole of the cross-section is in compression, for which concrete is adequate. But the major problem was to ensure that if you added concrete to the existing dam that you had to make the two masses of concrete monolithic. Remember at this time post tensioning and the like was probably little beyond the experimental stage. The solution, which I think was due to Mr Munt, was one that had been successfully applied on a dam in America – the Barker Dam – which had deteriorated badly due to ice conditions. The exercise was to increase the bulk of the dam by adding a section of concrete on the upstream side and this was possible because it was one of these dams that was filled by ice melt and was emptied [annually]. And the method adopted was to provide an upstream masonry wall [as a form] and fill the gap between that wall and the upstream face of the dam with a well graded aggregate from about 4 1/2 inches down and insert within that aggregate pipes through which grout could be introduced. Of course, this grout could be introduced from the bottom, and the hoses could be gradually withdrawn, and any water that was in the aggregate, being lighter than the grout, floated up on top of the grout and the result was a very fine dense concrete.
- RH So the hoses are put in first before the aggregate is put in.
- HH No. Actually the hoses were lowered into pipes which were slotted and which were all just, you know, rusty reticulation pipes. They were slotted at regular intervals, every 18 inches, with quite a substantial slash on the side. They were placed in the slots [between the new and old concrete] and were extended up with the aggregate as it was taken down. [The aggregate was placed] through elephant trunks to try and reduce the amount of fracturing of the aggregate as it went down and to stop the segregation.
- We experimented with this, built mock walls and grouted them, and the result was quite magnificent.
- Oh, I am a little bit ahead of myself. Barker Dam provided this [additional bulk] on the upstream side, but we had to provide ours on the downstream side.
- RH And this provided for differential movement between the two?
- HH There was allowance for that. Sections of the original wall were mortared to provide a bearing area for sections of the new concrete to slide on. These were lubricated which might have allowed for a limited sort of movement.
- RH So this was before the aggregate was put in?

- HH Oh yes. These were provided as the wall was constructed and brought up. And of course, by providing a slot between the new and the old, it gave us an extra surface to dissipate the heat of hydration.
- RH So instead of having one surface on the outside, you have got two – one on the outside and one on the inside?
- HH That's right. And to a limited extent, you have it on the sides depending upon the level of the adjoining monoliths.
- RH And if the new concrete wanted to move, it moved on these ribs?
- HH Yes. It was pretty limited, any movement that could have occurred, because the wall had a curve. So, you know, perhaps you could get a little bit of movement early in the piece. In fact, we put gauges in the manholes that we had in there, and measured the movement, and we couldn't really detect any. But that was partly due to the fact that we proceeded very slowly due to certain problems with the cement supply and with power supplies. The construction, as it turned out, was started too early because these things weren't available.
- RH So it would have proceeded faster, if you had started a bit later.
- HH Oh yes. You see, despite the fact that we had a bulk cement plant on site, a lot of our cement came to us in bags from Germany and England, which was a strange déjà vu situation, having regard to O'Connor's day. These bags were then slit open and put into the bulk bin.
- RH So what about cement from the local suppliers? That wasn't sufficient for the work?
- HH We only had the one cement company, the Swan Portland, and they of course had the usual wartime problems. A lot of their equipment was worn out. In fact, the government did come to an agreement with the Swan Portland to install a little bit of grinding equipment to try and increase the production. This grinding equipment was used plant that had been bought from a gold mine and it was installed by the Mundaring Weir construction group.
- RH There was a big labour problem at that time. Where did you find your labour for the work?
- HH It was a big problem. We had been called back to the department because it had been anticipated that there would be a need for a lot of public works projects to employ returning soldiers, but it didn't work out that way at all. There was employment everywhere, and we were short staffed. Although, fortunately, we did have a nucleus of people who had survived the Canning/ Samson/ Stirling dams and a lot of works during the war for the Allied Works Council. We did have this nucleus and they were with us. Then the personnel became available from Europe, through the Commonwealth Government's scheme for employing what we used to call Balts in those days, but they really came from all over Europe.
- RH These were displaced persons.



- HH Displaced persons, yes.
- RH It wasn't through the immigration scheme, these were people who had been displaced by the war.
- HH That's right. Yes. They came under contract to work for two years wherever they were required, and then they were free to go where they wished.
- RH Where did they come from mainly – the ones that worked at Mundaring?
- HH Largely Poland, I would say. But people also came from the Baltic states to a lesser degree, and I can recall one from Ukraine, which is a little bit surprising.
- RH How about Czechoslovakia?
- HH Yes, a few. Not very many. Poland mainly, I guess. Our first contingent of 35 would have joined us, I would think, in the first days of November 1948. I recollect that date because I remember a Friday, a Guy Fawkes night on the fifth up there shortly after they arrived, where some of the younger members joined in. We only had 35 then, but later on we got more, but the later reinforcements didn't come to us with the same sort of introduction that we got with the first 35. The first 35 came with an indication of their ages and their previous occupations, if any, and so on.
- RH So you got some people in the first group that actually had worked on construction work?
- HH No, no. None of them had. Most of them had had a dislocated time due to war and, I guess, their schooling had been interrupted. But some of them were mature people and very competent people. We had two professors and then we had 18 year olds.
- RH How did they get down to manual work? It must have been very difficult.
- HH Yes, and of course we weren't really prepared to handle people with that background, because so many of our foremen and gangers were ex-soldiers, and they almost regarded them as people from enemy territory. But they adapted pretty quickly. They soon established an esprit de corps. And I think the experienced gangers then took over, and showed them how to toughen their hands, and how to lift, and how to deal with snakes out in the clearing – that was a great fear of these people.
- And a lot of them went into the clearing.
- RH Was this clearing for the dam works?
- HH For the reservoir really. That was where all the clearing was, in the reservoir [extension]. We were raising by 32 feet and were told that you had to add some areas and space for flood levels. Yes, it was a difficult operation, because the original [reservoir] went back seven miles and, when we raised [the water, it would be] going back deeply into the Darkan and the Helena valleys. Clearing around the existing pondage was not easy, because you couldn't afford to drop trees into the water. You would have the problem of



getting them out again. So it was a more expensive operation than just straight out clearing, even clearing the forest.

RH Where did these people live then, the ex-Europeans?

HH Well, Mundaring having started straight after the war, we were only able to provide single accommodation. There were odd cases of married people living in tents but, for the most part, people were in huts, which were huts that had been purchased second hand from the forces. The first thirty or so were one man huts, small huts, but thereafter they were a type of shuttered construction, particularly favoured by the air force.

RH Shuttered. What was that?

HH Well, they were built on timber frames with masonite coverings, which could be opened up on all sides. And the roof itself was masonite also, with ridges at the top which were bolted together with a Malthoid [packing] in between to try and keep the water out.

RH Where did you and your family live when you were resident engineer?

HH Well, Don Munro was to have been the first resident engineer there. Don moved into head office and I moved into his place, when I went up there on Anzac Day 1947. Then I erected a smaller house alongside it which was recovered from a house that had been at Canning Dam, I think. We occupied this house, once it was built, but Don Munro didn't return to Mundaring Weir and the other house then became available. We didn't move back into it. We stayed in the house that we had, and the concrete engineer, whoever he might have been at the time, lived in the other one. We also built what we called a demountable house, which was based on American designs. It was in four foot sections with trussed roofs, and could be dismantled - and was dismantled and moved to the next site. Interestingly the American version had double headed nails. When you drove one in, you used the first head. When you wanted to remove it, you had the second head to pull it out.

RH That's quite a good idea.

HH Yes. We tried to get them made here but the demand wasn't sufficient for them to make it worth Eilbeck [a nail manufacturer in West Perth] doing it.

RH By that time, you had a little baby as well.

HH Well, our elder son was six months old when we moved to Mundaring Weir, and then the younger one was born after we had been there a couple of years. Our eldest son actually started school up there. He spent a year at the school, because we stayed in that accommodation for a year after the dam was finished, while I went around the country. He used to walk across the top of the weir to go to school up in the Mechanic's Institute by the hotel.

RH How long were you at Mundaring altogether?

HH Well, from Anzac Day in 1947 until it was finished in 51. We lived up there until December 52. By that time I had a house in Perth.



- RH Were there technical problems involved in pumping concrete, if it was something which hadn't been done before in the state?
- HH Yes, of course. The problem with it was that to pump concrete through a pipeline, you had to have sufficient water in the mix to provide a smooth perimeter and to reduce friction. A second problem was that when you had this slug of concrete running down-hill, it might start to run away, and air would be sucked in behind it. Then, if you got this air being sucked in behind it, that air, as the pressure came on was likely to run down your pipe and just take the top of your mortar away, and you'd have a high friction situation. You could block the pipeline. And you know, these eight and a quarter inch pipes were about 10 feet long, and when filled with concrete, I think, would weigh about 650 pounds. If you blocked the pipeline and you had to dismantle your whole line, handle these pipes and empty them, it was a fairly major wasteful situation.
- RH It must have taken you hours.
- HH There were two ways of clearing the pipe at the conclusion of the day. One was to introduce an instrument known as the 'Go-devil', which was really a double rubber washer type, eight and a quarter inches in diameter, and you'd pump water behind it which would push it in along.
- RH I think they call it a pig on oil pipelines, don't they?
- HH We used to call the pig the one which we used for the second method, which utilised compressed air. You'd introduce a hessian wad, which you would just push into the pipe. Then you would apply air pressure of about 80 to 100 pounds per square inch on it. If the [electrical] power broke down, having portable compressors on the job, you would then endeavour to clear the pipeline by using the pig and air pressure.
- But even then, you still had your problems because everything behind was full. Your pug mill had six tons of concrete in it and your concrete mixer had four tons of concrete in it. Then the bin above the concrete mixer which was your batching bin, that would have another four tons [of aggregate] in it. In any case you always started [concrete pumping] operations by introducing a grout. You'd pump the grout ahead of your concrete and that's how you got your first lubrication and you needed the grout down in the box anyway [to assist adherence of the new concrete to the new.] Because everything was full behind and you were all set up for concrete, you then had to provide your grout by some other means. So there were problems. Of course the power station was having a very grim time. One machine blew up and ...
- RH This was a second hand power station, was it?
- HH No. This was East Perth Power Station, it served the whole metropolitan system.
- RH Oh, I see. You didn't have your own power.
- HH No, no. we ran a power line up the valley. The whole power system was in trouble. The interesting observation of the new Australians that were learning the language, of course, was they were quite uncertain as to

whether it was a power house, or an hour house, because, at times, the power used to be provided on a one hour on and one hour off basis.

#### **Pause in tape**

RH Good morning, Harold. I am talking to Harold Hunt this morning on the 24 March in our second interview.

At the end of last session, Harold, we were talking about Mundaring Weir and about how you grouted the aggregate in the slot between the new work and the old work. There were some special additives given to the grout to make it more easily workable. How did you do that?

HH Yes. The grout mixture, I remember, had a water to cement ratio of 0.70 and a water to cementing materials ratio of 0.53. The second cementing material was fly-ash, which was introduced on the basis of 188 pounds of cement and 62 pounds of fly-ash, totalling 250 pounds. This was mixed with the same amount of sand, a fine sand.

#### **End of Side A, Tape 2**

#### **Side B, Tape 2**

HH Also included was a wetting agent, Teepol, or sometimes Cheecol, [the latter being] the wetting agent produced by the Shell company, and in addition to that there was a small amount of aluminium bronze added. The aluminium bronze had the effect of expanding in the setting process, but if the expansion was not controlled, it would have the effect of reducing the strength of the resultant concrete, but when it was confined, it had no ill effect.

RH The fly-ash came from the East Perth power station, didn't it?

HH It came from the power station at East Perth, and it was well suited for the purpose. The big concern was its carbon content and, I think, as I recall it, that this was about three or four per cent, but it is all recorded in a paper that Don Munro put out. At Mundaring in our laboratory, we did a lot of tests with fly-ash. We also built mock-ups of the slots [between the new and old concrete] which had windows in the formwork so that we could observe the way in which the grout penetrated [the aggregate].

RH Because you couldn't see how it performed at the bottom of the dam.

HH You couldn't see a thing. No. You just saw the top. The grout was injected, I suppose, at about eight foot intervals, but in between, pipes were installed to enable the grout level to be monitored as it came up. There was water in the slot but the grout being heavier, raised the water up. We had to devise our own floats, which went through the water but stopped on the grout. We always knew whether we were getting full penetration, and it went surprisingly well.

RH So you had a series of slotted vertical pipes, some of which the grout was put into, and the other ones were used as observation holes.



HH Observation holes, yes. It was a messy procedure. Rather than risk problems by mixing the grout up at the main batching plant, it was all done on each monolith.

RH Was it?

HH Yes.

RH Manually?

HH Manually, and it was a slow process. We also had a special mixer, which we had designed ourselves, to keep all the materials in suspension, while they were being pumped down into the slot, by means of diaphragm pumps. We had a similar procedure later down at the Wellington Dam. By that time, we were sufficiently confident to use the main plant. Everything was mixed there, transported [by pump] and delivered into the mixer at the monolith. That was a much more simple procedure.

RH You didn't use the main concrete pump for the grout. You used a different type of pump.

HH Oh, yes. It was just a small [diaphragm pump] I think we had two concrete mixers of about five to seven cubic foot capacity [at Mundaring].

RH Was this the first time that fly-ash was used in Australia in that sort of work?

HH I think it was. I think you will find that this was borne out by the paper that Munro produced. Some years later, of course, it was used in a big way in Tasmania in dam construction.

RH Actually in the main concrete?

HH In the main concrete, yes.

RH There must have been savings in doing that.

HH Yes, there were savings, but the big advantage was that it reduced the heat of hydration. As far as grouting was concerned, even for pumping, it improved the grading of the materials.

RH After you had finished at Mundaring, you traveled around doing other dam work or supervising it.

HH Yes, that's right. When I went down to Perth, Morawa Dam, with resident engineer, Clem Eaton, was very well advanced. It was in its closing phases. It was a seven million gallons excavated tank, which had been lined using shotcrete.

RH Oh. Was this the first time that shotcrete had been used in the Public Works Department?

HH Well, to line a dam, yes. It wasn't very successful, as a matter of fact, because it had been thought unnecessary to put reinforcement into this three inch layer. And it had cracked very badly.

RH That's a bit optimistic – three inches!

- HH Yes, and this involved a lot of repair work. The catchment was interesting in so far as it was a combination of a bitumen catchment and an earth catchment which had been graded and rolled in a road formation.
- RH Is that what they call a roaded catchment?
- HH Roaded catchment, yes. So the slopes of the road were about one in five to one in seven and they would shed water between successive roaded sections and deliver the water into a channel which would eventually discharge into the dam. Of course, everything had to be arranged and designed so that movement was lower than the scouring rate. That was regarded with high hopes in those days, in the late 40s and early 50s. The Public Works Department provided a service for individual farmers, and went out and graded up small sections of their properties to provide for this. The sort of result that was achieved was that in about a 12 inch rainfall area, 25 acres would produce one million gallons of water. That was the rule of thumb that applied, and of course it depended very largely on the intensity of rain. For example, in that Morawa area in that northern wheat-belt, you relied on catching the early rains in May and June. That's when you got the higher intensities. Later on in the year the light rains weren't so productive.
- RH These were earth catchments.
- HH They were earth.
- RH A lot would depend on what type of ground it was, wouldn't it?
- HH Yes. You didn't require very much clay to make them suitable. You had as little as three per cent clay, but they were rolled with multi-tyred rollers. The collecting drains were constructed with a grade of about one in 400. That was about the limit for them. Of course where you had grades in excess of that, you had to provide drops to achieve a non-scouring velocity.
- RH I believe there were also quite a few municipal dams built in that area, in the northern wheat-belt, at that time.
- HH That's right. Carnamah was constructed. That was again an excavated tank, and the resident engineer was Steve Shelton and a roaded catchment was used to provide the run-off. A similar procedure was adopted to Perenjori, which was about 30 miles south of Morawa. At Mingenew, which was an area that I had known from when I was a little boy, the solution was a different one. There our very capable drilling supervisor, Arthur Frizzell, was able to master the very fine sands to the west of the town. He constructed some bores which had very special fine screens, and were able to provide a [continuous] water supply. It was very clean and very cheap. That was a really big success up there. At the same time, of course, Geraldton water supply was a major activity for our particular hydraulics branch.
- RH That was a bit more difficult, wasn't it?
- HH It was on a much bigger scale. The dam was about half way between Geraldton and Mullewa which meant that it was more economical for us to produce our own power. In the end we had quite a long pipeline with two break pressure situations en route, and the supply was gradually improved from four million gallons a day to 10 million gallons a day.



- RH What was the name of that dam?
- HH Wicherina Dam, which in turn had been noteworthy in so far as its water was so precious that, [before the war], it had been considered worthwhile to put a roof over the dam. I can't quote the precise area, but it had some acres of roof.
- RH That must have been one of the first country dams to have been roofed.
- HH I guess so. It was roofed in the twenties.
- RH And the water was all from underground sources?
- HH Well, there was a catchment which sometimes didn't yield at all. Sometimes when heavy rains occurred, of course it did. But the bulk of the water came from underground. There were lots of problems to be dealt with there. The water was aggressive on the screens.
- RH Corrosive.
- HH Corrosive. Screens weren't so readily available at that time and we used to have our own made up at the State Engineering Works where we used to wind a wire [unit]. We finished up using stainless steel wire on a framework which [lasted much longer]. But we went through all sorts of materials such as copper and bronze. Some of them only lasted a couple of months. But the stainless steel lasted some time. On top of this, even though we'd converted the electricity in the field from DC to alternating current, we were getting stray direct currents running down the bore holes. The electrical people found a solution by introducing insulation [to break the circuit]. It was an exercise that was, I suppose, fairly typical of the earlier years where the RE had to be mechanical and electrical [as well as civil].
- RH Jack of all trades.
- HH Yes, yes.
- RH Who was the RE on that work?
- HH They varied. We used to endeavour to give our people a range of experience while they were young and before they had children going to school, and that sort of thing. But Dudley Campbell, who subsequently left us to go to the Tasmanian Hydro-electric and later went contracting, was there for a time. Another resident engineer was John Abbott, and they had at another time Mervyn Turner, who was in fact a mechanical engineer who joined us towards the end of Mundaring from Cresco Fertiliser Works. There was sufficient money each year to take the total scheme up to a slightly higher output. So there was work on the three sections of the pipeline. There was work on the bores, and there was work in the pump station. And at one stage, we had to put in a separate off take into the dam. So it was variety.
- And [the money] was used also to redesign the above-ground pipeline to some extent, in so far as we didn't follow the procedure that was adopted by the Country Areas Water Supply branch in the Goldfields Water Supply main where they had overhead [concrete blocks] at certain spacing and the rest of it. We used to carefully survey the ground, and only put overheads in where



they were actually required. I think this was roughly where the grade change was something in excess of one in eighty. Again the pipe itself was welded up into long strings and the final link-up was done at a mean temperature, usually about 70 degrees, which in that area, you got at about six o'clock in the morning. You'd have to lift up the line, and relieve any stress that was locked in, and then link it up. This made a beautiful pipeline. It was graceful and it was more economical.

RH So you didn't have to rely on the concrete blocks to stop the movement due to temperature changes.

HH No, I would imagine that perhaps in the three mile rising main from the pump station they wouldn't even have had more than one or two overheads. But it required more careful surveying, of course.

RH So you used the differences in the ground to anchor the pipe.

HH You were prepared to limit the grade changes between pipes, so long as they were less than one in eighty, there was no need for an overhead, so over a length you could get quite a substantial change in grade.

RH So if there was some movement due to temperature, it didn't matter too much.

HH No. The pipe had to withstand the temperature stresses, the stresses due to temperature changes. We also had to construct in these[works] some storage tanks in the general improvement of Geraldton water supply.

Then, some while later, the Wicherina scheme was abandoned for the Geraldton supply in favour of one at Allanooka, which was south-east of Geraldton, heading towards Dongara. Then the Wicherina supply was turned around and supplied the township of Mullewa to the east. So all in all there was a very substantial improvement of water supplies in that general Midlands/ Wongan Hills area.

RH Wongan Hills' supply was a little bit of a problem I believe.

HH Yes, yes. Wongan Hills was a rock catchment dam at Mocardy Rock. Here the procedure that had been developed over the years, going back to the Coolgardie pipeline days, of erecting contour drains on the rock itself to discharge into a channel, which was lined and discharged into an excavated tank – usually around six or seven million gallons, which was about the size that was used in these towns. The theory was that it started off unroofed and was adequate [to supply a small town], but by the time the town had doubled in size then a roofed tank would give the same sort of supply [per head]. It wasn't a terribly generous supply. It was about 50 gallons per head per day in the summer. The Mocardy Rock scheme was bedeviled by financial shortages. It was closed on two occasions, and on the second occasion there was some damage, [due to groundwater percolation,] done to the clay lining that had been placed to make the dam watertight. But once the dam had been completed, all the rock drains constructed and the inlet channel and by-wash and that sort of thing in place, then it served very well for some years.



RH You say they closed it because of shortage of finance. Was that anything to do with money being diverted to works at Kwinana for the BP refinery?

HH Yes, I think that would have been the reason for it. It also affected our next major dam, Wellington Dam.

RH So Wellington Dam started in 1951 or something, did it?

HH And then it had to stop. I couldn't give the precise **date from memory** as to when it was reopened.

RH Was work restarted when the hydro work was done?

HH That was done afterwards.

RH That was something separate then, was it?

HH It was done later, when the dam had been raised. That was when the two megawatt hydro plant was installed.

RH What was the idea behind that?

HH It was [to provide] cheap power. The dam had been made a little higher to provide for it. There was a short penstock and a very large pipe, running down the hill into this small plant. The SEC regarded it as being worthwhile at that stage.

RH That was before the south-west was joined into the rest of the power grid, I suppose?

HH It was done during the course of the construction of the South-West Scheme.

RH The Wellington Dam raising took quite a time to complete then, did it?

HH Yes. When it was reopened, Roy Hamilton was the resident engineer. He had some pretty good staff, too. He had Steve Shelton as his concrete engineer, and John Abbott was there for a time. Dudley Campbell was also there for a time. Dudley Campbell was the quarry engineer. Wellington proceeded fairly smoothly because everybody [benefited from] the experience of Mundaring. It was a repeat job. That is a luxury that civil engineers very seldom get.

RH There weren't any special problems with Wellington then, compared with Mundaring?

HH No. Well the grouting of the slot was a piece of cake. There were a few problems in placing the concrete. It had been anticipated that the load on the pump would be in excess of a pumpable distance to the south end [of the dam]. Provision had been made in the estimate for a conveyor belt to be introduced to reduce the [pumping] load, but it was [unnecessary]. Because of improvements to the grading of the sand, the pump managed to meet the full load. But the Wellington Dam sand pit was unusual, in that the sand was fairly coarse. The fineness modulus was about 2.4, whereas the sand we'd

used up at Mundaring was 1.9. So we introduced some of the finer fraction from sand down the coast and that made the difference.

RH So by that time were you the Construction Engineer in the hydraulics branch.

HH Yes, that would be right.

RH You had quite a number of engineers working under you.

HH Yes. A very elite group – very fine young engineers. The Public Works, particularly at that time, had a theory that your best engineers went into construction, particularly on country works, because they were left much more to themselves there. Even the branches of the Department were organised in somewhat the same way in so far as the branch head was responsible for the construction and the design of works. And the design side of engineering wasn't well catered for. I'm not saying that the people who were designing were not good designers, but in the past, this work had been done by draftsmen, very experienced draftsmen, but they were kept as draftsmen. But at about this time, they started to recognise that the design engineer was a much more important person than he'd been given credit for previously.

RH So someone like John Le Page spent his whole career in design work, didn't he?

HH That's right. Well, see he started off as a drafting cadet. There were some very fine engineers there from the goldfields. Men like Macbeth, H. Davies, and I. Davies. They had been trained in the Kalgoorlie School of Mines, which was a very good school because they saw engineering all around them.

I digressed somewhat to indicate that I did have a very good staff in the field, and by this time, Ken Kelsall had joined us. He had been at Mundaring, and then when I became a branch head, he joined me in headquarters as the Principal Assistant. And in between Mundaring and then, he'd had a period constructing irrigation works in the irrigation areas of the south-west.

We had a lot of work on at the time. We also built a number of swimming pools– the first one at Northam. That was quite a substantial swimming pool.

RH I suppose they are hydraulic works after all.

HH They are, yes. Hydraulic is a very abused word, isn't it. hydro for water, aulic for pipe {laughs}. We also did swimming pools at [Goomalling and Quairading], and around this time, there were a number of south-west water supplies constructed.

I supposed the biggest of these – oh, I don't know about the biggest, but certainly one of the major ones – was the Bridgetown water supply. Previously, Bridgetown had relied on a dam with a natural catchment and when we went down there to build a majorish scheme, Bridgetown, that summer, was on three gallons per head per day. It was [minimal]. But the scheme, as it had been designed, was for a dam at Millstream, which was some 20 miles out of Bridgetown, and the pipeline – largely gravity, because



Millstream, strange to say, was at a higher plateau level – and then a pumping station, service reservoir and above ground pipeline.

It was an excellent job. Some of the ground was very, very treacherous. There were a lot of land slips in certain areas. It was a job that required a fair bit of public relations effort, too, because it involved some of the earliest alienated land in the state and the properties were very isolated. There were no roads going through them. Well, there was access, and that was all. But there was no continuous road going along the route of the pipeline which was the direct route into Bridgetown. People were very resistant as they felt that they were going to have easements placed on their titles. John Abbott, as the resident engineer, and the Member for the district, John Hearman, who later was the Speaker of the House, and I did a very slippery trip through all these properties talking to landowners. John Hearman was very helpful, because people saw him as their ally and they saw us as the enemy. But amongst the people there, there was one very interesting gentleman, not that we saw him at that time. It was later on that I caught up with him. He was a Mr Harris who was an Englishman. He'd owned land, I think it was near Southampton, which had been resumed for the purposes of an oil refinery. He had this property on the Blackwood River, Bridgetown. He also had a sheep station at Learmonth and that area. Lo and behold, along comes Wapet and the first hole that they drilled on his property - hydrocarbons.

RH Oh. Rough Range.

HH Rough Range, yes. And then of course we went through his property down there.

RH I don't suppose you were so popular!

HH {laughs} Of the towns that we provided supplies for, there was a group in the Great Southern for which Steve Shelton was the RE. One scheme provided the water supply for Mt Barker. The source of water was the Porongorups where a dam was built. A little to the north, we put in a supply for Cranbook, and a little further north again, a supply for Broomehill. And that was a very nice combination of varied work. The earth dam out at the Porongorups was in large measure the work of Neil Kenworthy. There was quite a lengthy pipeline into the town. Not a terribly striking structure, but an interesting one, was the service reservoir, which was a one million gallons excavated reservoir and, just as an indication of how short money was, the lining was restricted to one and a half inches.

RH Good heavens.

HH The soil was watertight, but they didn't want to have dirty water and we placed this inch and a half very successfully using a slipform. That was the first time we used the slipform. The next time we used it was up on the Ord diversion dam.

RH Well that brings us up to the next stage in your career, in the work in the northwest.

HH No, before that there were a couple of other projects. There was the town water supply for Nannup. Ernest Shelton was the resident engineer, where



he built the Tanganarup Dam. And there was also the town water supply for Denmark.

RH So you saw quite a bit of the south-west.

HH Yes. We were also looking at water supply for Esperance. An excavated dam had been considered and finally, a little later, the ground water supplies were okay. Then there was also a water supply for Augusta, which was based on some very hard water from out of the Leeuwin.

RH Yes. Limestone.

HH And I haven't mentioned Albany, which was a major water supply project. Water had been brought in from a source some 20 odd miles to the east where there was a small barrier, a small dam, at Waychinicup, I think the name of the place was. Albany at the time was growing quite fast. We had built a service reservoir there.

RH That would have been the time of the woollen mills in Albany, wouldn't it?

HH Yes. That affected us quite a little bit because we did improve the supply by the provision of a groundwater scheme from the south of the harbour. But this was hard water, so had to be softened to give the Albany Woollen Mills the quality of water that they required. There was also another episode in the saga of improving Albany's water supply, in that in a period of great scarcity, water was pumped from Lake Seppings, which is a lake right within the town area, getting towards the Middleton Beach.

RH Oh yes, I know.

HH This water was peat stained, and due to John Lewis, a treatment plant was designed and we successfully removed the stain from this water. A similar plant was built at Denmark to overcome a peat discolouration in the water there.

RH How was it done? By chemical dosing?

HH Yes. The usual but, instead of buying marketable components, everything was done from scratch, including, I suppose, some unusual valve systems, but it worked. And I would think that might have been the first time discoloured water was treated in Western Australia, and of course, it was very significant for the events that were to occur in the metropolitan area later on.

I think that deals with most of the works in which we were involved in the south-west. We weren't doing irrigation. That was being done by the Irrigation and Drainage Branch. While we were called the Construction Branch, we weren't doing the harbours. They were done by the Harbours and Rivers Branch and we had a small involvement with the Goldfields Water Supply, Country Areas Branch, as they were then named. And we had a small involvement in the work on the main conduit, but for the most part, the work was done by that branch. And it was at this point that work commenced up in the north. Well, actually, the two were concurrent to some extent. Wellington was just finishing off when we moved first into the Fitzroy.



- RH This was the Camballin scheme.
- HH The Camballin scheme, yes.
- RH This was for rice growing, wasn't it?.
- HH Some rice growers from NSW, from the irrigation areas there, were anxious to set up an industry on Liveringa Station.
- RH Didn't Kim Durack have something to do with it?
- HH He had a lot to do with it. Yes. Kim Durack had been involved in the experimental work on the Ord, and he was certainly involved with Liveringa. I think really he was linked with this firm originally. He was certainly the manager on the site for the first year.

## **End of Side B, Tape 2**

### **Tape 3, Side A**

- H There had been some [structural] failures and John Lewis and I went there with the object of perhaps becoming involved. Then John's people did some remarkable design work up there, because there was no information at all.
- R Who was responsible for the work before?
- H It had been done by the North-West Branch, because that was their area. North-West Branch was essentially a harbours and rivers group. They maintained the services in all the north-west towns, the jetties, harbours and rivers and was shortly to come in and do the Wyndham harbour.
- R Was Frank Bottrell up there then?
- H Oh Frank was there quite early in the piece, when Samson Brook closed. He would have been there in '41, and he put the first irrigation pumping station in [on the Ord Scheme] in '41.
- R Was that at what they call Carlton Plains?
- H No, the first one went into an area which was mainly red soil. The bulk of the area to be irrigated up there was black soil, so it wasn't the perfect location. But a second pumping station was installed in 1947 by Ken Kelsall, at the site of what became the Kimberley Research Station. He went there from, I think it was, Stirling Dam.
- R Sorry, I side-tracked you. We were going back to Camballin.
- H Camballin, yes. The problem with Camballin, of course, was that there were no records. Nobody knew what floods had been, and it was such a vast area that some of the tributaries were carrying flows which were as large as you would get in any river in the south-west. But it all depended on where the rain was. What had caused a lot of the trouble with the first structures which were built there was that the water came the wrong way.
- R Very inconsiderate.

H Plugs had been put in cross-connectional channels between a parallel anabranch to the main stream, to stop water coming back from the main Fitzroy River to flood, [or drain], these areas; [an anabranch being a branch which leaves the main stream and enters it again further on.] In fact the rainfall fell in another catchment and [the anabranch flowed in the opposite direction].

Over a few years, some interesting structures were installed at Liveringa. The major worry with the project was that rice is very subject to temperature at the flowering stage of the plant, and if the temperature gets below 70 degrees, the grain doesn't set.

R So you have to plant it just at the right time.

H And to plant it at the right time means that you have to have water at the right time, but that didn't occur because you had water when the river came down, and then it also had to be controlled. The structures that were built were a fairly substantial dam, an earth dam, with long levees. The ground was so flat.

R Is that what you call 17 mile Dam?

H It was 17 miles from where it took off from the Fitzroy River. And we built a pump station and a barrage where the anabranch, Snake Creek, took off from the Fitzroy to supply the 17 Mile Dam. The pump station was rather fascinating because it was raised up on steel stilts, because it had to be clear of flood levels. There was an arrangement for the pumps to go down an incline framework to pick up the right levels [for pumping]. The barrage was a structure that had been designed by John Lewis as a copy of what he had seen in India, when he and Dave Bryden visited there. They went there after John and I had had a good look at the weirs on the Murray. This barrage was a brilliant concept in so far as it was built on very pervious sand, and it was built by providing a long seepage path and with some provision for uplift on the downstream side. It consisted really of a masonry structure supporting shutters, which were, from memory, about seven feet high. And these would lay flat when the river came down in flood and then could be [tilted upwards transforming the structure into a water storage structure. The erecting operation used] a machine which was called a plough, because the business part of it was similar to the shape of the mould-board of a plough. It picked up a knob on the top of each shutter, and as it proceeded [across the flowing Fitzroy River], it raised [each into] the vertical position, where the mechanism allowed it to click [into position]. It would go right across the [barrage] structure, while the river was coming down with a large flow. This structure, despite the fact that it was only 10 to 12 feet high [overall], stored about as much as the Canning Dam.

R What stopped the water going in between the shutters?

H Oh, there was some sort of a rubber seal. Perhaps a seal on the upstream side, I would guess.

R Oh yes.

H The shutters, of course, collapsed when the flow over the top of them exceeded two feet or a figure like that.



- R That must have been a dramatic sight.
- H That river, when it came down in flood, was awesome. But unfortunately, Camballin always looked promising and something would always go wrong. It was about at this time that the Commonwealth government was receptive to suggestions for developing the north because these were the years when there was a concern that a communist influence was working south and could expand into Indonesia. And East Timor wasn't very far away from what became the Kununurra area. If you turned your radio set on there you got music from Indonesia. You wouldn't hear anything of Australia. The Commonwealth Government provided funds for development of the north. The funds first took the shape of improving communications for the beef industry.
- R Was that the beef road business?
- H Beef roads, and at the same time there was money for harbour improvement, particularly Wyndham, even though Wyndham had relied before on ships' gear to unload and then the goods unloaded had to be taken back down the length of the jetty to be put into storage. See, you didn't have transit sheds right on the end to speed it up. Then, of course, it was all an expensive business, because it was tidal, and required special ships with flat bottoms to sit on the mud. [In addition to the work there], funds were also found for a jetty at Broome. Also, while this was going on, there was research being conducted at the Kimberley Research Station into various crops.
- R Was the Agricultural Department involved in that? Or did the CSIRO come later?
- H Both. They were both involved. It was very much an agricultural science station. I think that the man in charge was a CSIRO man, but there were West Australian Department of Agriculture scientists there, involved with experiments in cotton, rice, sugar cane, oil seeds. I think it could have been at about this time. Yes, it certainly was. There was some money found for some broadacre experimental work. We put in a pumping station to service what became a pilot farm at Kununurra, which would have involved a bit of red soil and a bit of black. It was mostly black.
- R That was for fattening up cattle, was it, those broadacres?
- H They were also interested in rice at the time. The first crop that went into the pilot farm was rice. Again, everything looked marvellous, but the crop yield wasn't very good.
- R When the money first came for the diversion dam, how was that made?
- H That came shortly afterwards.
- R Wasn't it a non-specific grant from the Commonwealth for certain works in the north.
- H Yes
- R ... and didn't the state government decide which ones they were?



H Well, they had to be approved by the Commonwealth and for all of the funds that went in there, the Commonwealth economists would come over and do cost benefit studies. A very difficult exercise when you don't know what your markets are going to be, and you don't know what your yields are going to be. But money was found for the diversion dam.

R It had to be spent in a very short time, I think, didn't it?

H Yes, I think that's pretty right. There certainly was an accelerated effort and by this time the Liberal Government was wedded to the idea of contract work, contract construction. In over a period of 12 months, John Lewis recruited and built up a team to design the diversion dam and to design irrigation channels. One of his key designers here was Ken Webster,[ex UK] who had spent a little bit of time in Western Australia, having married a West Australian girl, but he then went to the Tasmanian Hydro-electric. He came back from there and took charge of this special design section that John Lewis had constituted, and they came up with the design of the diversion dam and for the irrigation of the first 10,000 acres. Once again, here was a structure to be built to withstand very large floods. Probably, while the annual flow of the Fitzroy was greater than that of the Ord, the actual [peak] floods were greater on the Ord. And they had been recorded for a number of years, going back to when we were at Mundaring. The usual procedure was to engage a couple of university students to go up there. First of all, they just observed the level of the flood and the velocities of the water. The [methods] kept on being refined a little bit until a cableway was put across the valley. An operator could then go across on this and take current readings of the flow, over the full cross section.

But the diversion dam had to be designed in such a hurry that they didn't have time to design steel gates to pass the flow and an arrangement was made with the WC & IC in NSW to have the use of their design.

R Was that Water Control and Irrigation?

H Water Conservation and Irrigation Commission, yes.

[The gates had been designed for the Keepit Dam.] These [gates] had to be put out to tender [very early]. Well they certainly had to go out before the dam was ready for [tendering].

R They were huge structures, weren't they?

H They were huge! They were 37 feet high and 45 feet wide and the bearings [structure on which they pivoted] weighed about 19 tons. They all involved [a handling problem which required the use of] ships' gear! The tenders were called for the gates, which had to be progressively delivered when they were wanted. They had to be erected [first] at the workshop. Fortunately the lowest tenderer was Vickers Hoskins. They were excellent contractors.

R So they were erected in Perth and then dismantled and shipped up there?

H We had [a mechanical engineer] inspect them when they were assembled and make certain that they were right. Because it was a far away project and major works hadn't been [constructed] up there before, it was decided to rivet them rather than to weld them. By this time the tenders were ready for the



diversion dam and the successful tenderer was Christiani and Nielson. Once again, we were very fortunate in having an excellent contractor. Harold Clough was also involved in the partnership.

R Did he do a particular part, or was he a general partner?

H No, he was just a participant, a financial participant in the group. Ott Nielson was very much the manager of the whole show, and a very able one.

R What was your role in the diversion dam?

H My role was that of engineer for the contract, and also for a number of other contracts. The diversion was built over two dry seasons. In the second dry season there was an irrigation channels and structures contract, for earthworks and concrete bridges across the main channel, which was a massive channel. [Rice requires a lot of water, and the channel was designed for a flow of 0.025 cusecs per acre.] Other contracts were a power station, electrical reticulation – all designed by our electrical people to withstand cyclones! [laughs]

R Was this to be in part of Kununurra, or was it independent of Kununurra.

H This became Kununurra. It was higher ground, just on the fringe of the irrigation area. The first couple of homes that were built there we used to accommodate some of our key people living singly up there. It was an interesting time, because we were very interested in concrete technology, with our exposure at Mundaring and at Wellington. Here we had new problems in so far as the aggregate was plucked out of the stream bed and it was all rounded aggregate.

R That's not surprising!

H which was very economical, of course, in cement requirement. With experiences of handling bagged cement imported from overseas and the eastern states at Mundaring Weir, I won the day, and required the contractor to install, not only bulk cement, but also bulk handling by ship, which was a little bit cheeky for the small amount of concrete that was involved. The next problem was that the velocities of water undershooting these gates was in excess of what was regarded as the point at which cavitation occurred. This meant that the size of the aggregate had to be limited in the sills of the structure and it had to be a very high strength concrete.

And the next problem was [providing for] hot weather concreting. Fortunately, membership of the [American Concrete Institute] over a number of years stood us in good stead. Victor Munt had been a member from way back, you know, from when he first went over [to the USA in the 1930s] and Ken Kelsell and I were both members of the [American Concrete Institute]. So we were well equipped to handle those problems.

R Were they still talking about using concrete for the main dam then? Or had they decided against it?

H At the time, on the main dam, the site was fixed. There was a little bit of excavation work and a little bit of tunnelling into the embankments, but it was still planned to build it of concrete.

Our irrigation contractor did very well in his first season, but started late in the second season, because he was dragging his feet in a wet season contract that he had taken on in Darwin, and he was late back. By this time his machines were getting sick, and his key man had left him, and there was trouble all along the line on that contract. The sub-contractor doing the bridges was likewise in strife, and we had the spectre of the dam being finished and no channels being completed.

That was avoided. There was a lot of wet weather work and there was some ill-feeling.

R The contractor didn't go bust in the process?

H He didn't go bust, but he was awfully close, and we had a very major Supreme Court case dealing with this some seven years later. He took out a writ against Gerald Percy Wild, the Minister, and Harold Ernest Hunt, the Engineer.

R I see.

H A lot of money there. But the diversion dam was completed and water went down the main channel. The first five farmers had been selected from Australia-wide, and they included some experienced West Australian people. They included people from the Eastern States. From that point on, for a number of years, the irrigation area was extended a little bit year by year, and some more farmers were brought in until we got up to the extent of the 10,000 acres that were provided for by the first channel.

R When did the heliosis moth appear?

H Well, rice was tried in the first place on the pilot farm, which had been let to the same group that had been interested in Camballin. Their manager, Keith Gorrie, was a very experienced rice man. But then, by the time the farmers got there, cotton was the rage. And the first crop planted by the farmers was cotton, and this involved us in the very interesting exercise of building a cotton gin.

R The first crop was cotton, then, not rice.

H Yes, with the farmers. But on the 2000 acres of the pilot farm it was rice, and cotton and oil seeds –soya beans and linseed.

R What does a cotton gin look like?

H What's a cotton gin like? Oh you have to take the seeds out and extract them. Oh it all works by compressed air {laughs}, and of course there's a baling process at the end of it all. But it did work.

R So the Public Works Department was responsible for building that.

H Yes, the Public Works Department. I think the government provided the funds for it.

R What about people like Wesfarmers?



H Wesfarmers were very much involved, yes. They had a co-operative up there. The Wesfarmers also had the first store up there.

R And when did the moth problem start appearing?

H Oh, quite early in the piece. Yes. They were spraying in the first year, spraying by fixed aircraft first. I think it was in the second year that it had got so bad that they were spraying in very close intervals of time and this made it uneconomic.

The Ord attracted all sorts of visitors. Commonwealth Department heads, certainly lots of federal politicians. They used to go up there every year. The Food and Agricultural Committee, under the chairmanship of Geoff Bates went up there. [To recall a few of the] overseas visitors, I remember the editor of the *Economist* going there. I remember a Governor of the Bank of England going there. He was escorted by George Simpson, who was the manager of the Commonwealth Bank here at the time. The people from Darwin were there, including the Administrator, who was an agricultural man. Murdoch went up there with a journalist. He was producing a series of articles to stir the people of Australia up to their responsibilities in developing a vacant north. At this time there was work being done in Queensland too, particularly with beef development, and there had been some unsuccessful efforts at growing rice at Humpty Doo in the Northern Territory.

R Do you think the actual work on the Ord was a bit premature, or needed some more research, or do you think they could have avoided cotton and gone for other types of crops.

H It is very hard to say, and of course, I don't suppose I'm qualified to give an opinion. But I can tell you that the agricultural scientists were regarded as being very, very conservative, whereas in fact they may have been perhaps better informed. They had a reputation for standing on the hose [laughter], but nevertheless, they did a pretty mighty sort of job themselves. You know, it is very hard to say how you develop industries. In my time, the wheat industry almost looked as if it was finished here. I was a boy when wheat was down to 1/8 a bushel and there was no future in going farming. Gradually skills were developed, and they became very expert in processes of dry farming. No doubt there was an accelerated increase in knowledge required by going at the Ord a little bit rapidly. I suppose you could argue that the main dam was built a little early. The diversion dam was more expensive to build to provide for the major flood that was coming down, and the [main dam] wasn't visualised. The approach was that the scheme had to prove itself before you went to the main dam. It was about the early '70s when the main dam was approved. I had very little involvement with the main dam – next to nothing – because in the first year the main dam was under way, I was in the Supreme Court for months on end, dealing with this channels contract. Then early in the next year I took some long service leave. I'd been in Perth some years before that, actually. I'd been transferred to Perth as a staff engineer. They used to call us Executive Engineers, and [I was] really on the staff of the Director and Ken Kelsall had succeeded me.

R So when did you become Chief Engineer?

H That would have been in 1970. My period as Chief Engineer was dislocated by this court case and then by taking some long service leave after it. It was shortly afterwards that I moved over to the Met.

R So these movements were all started off by Don Munro retiring, weren't they?

H No, no. Not Munro, Parker. John Parker retired and Don Munro was the only applicant for the job, actually. He was regarded to be the logical successor. And this would have been when I took Don Munro's place as Chief Engineer, Public Works. There was the Director of Engineering and there was a Chief Engineer of Public Works. The Director of Engineering for some years had been almost full time involved in industrial development.

R Yes, the northwest.

H There were special committees providing for the development of the Ord and the Pilbara had started. These involved Mr Court, as the Minister for the North West, and he worked through John Parker and John Parker was the man who made good the plans.

R Parker's parliament they called the committees, didn't they?

H Did they? I didn't know about that. It was like that while that was happening. Don Munro was very much involved in it too. Don Munro wrote up the documentation that was required to get new farmers up there. Neither of them was very much involved with the Public Works.

R When Munro left the Public Works, he went to where?

H There had been a change of government and the new minister was Herbie Graham. He wanted his Chief Executive there in that office next to him. Now this is why it was a reluctant Don Munro that went down there. He would have liked to have stayed in the dual position.

R Oh yes. Because he had to decide between engineering and coordination of development.

H That's right. Dumas had filled that position when he retired and then Parker had really.

R Unofficially, Parker had done it, then?.

H Yes.

R And now the two were split.

H Yes.

R You left to become Chief Engineer to the Water Board.

H That's right. That was in about April '72 or thereabouts.

R And that was after Bob Hillman had been ...

H He'd been appointed Director of Engineering.



- R It was quite a busy time in the Water Board, to put it mildly, in the 60s and early 70s.
- H It was a magnificent time, really.
- R What were the challenges facing you when you first came?
- H [laughs] Well, the most immediate one was that a bauxite company, [Pacminex], was proposing to harvest the bauxite from the northern catchments, the catchments north of Mundaring and they were proposing red mud lakes right on top of the Gnangara Mound and that was the first problem that I had. And of course I could see, with my experience at Wicherina, I could see where the future lay for water supply for Perth.
- R So when did Gnangara Mound and the Jandakot Mound come into the forefront of the Water Board planning. Was it during the 60s or earlier?
- H In Kenworthy's day Serpentine Dam was his great interest, and I think the Met Water had always thought in terms of surface water. Right up to 1971 they were talking about bringing water up from the Murray, separating the salt from the fresh and bringing that up, but there had been a start on groundwater and there were a few bores in the Gnangara area, but it only developed ...
- R In the Wanneroo area
- H Yes, but it had only been developed to the extent of production of one million gallons per day. That was the point at which I came in. And there were plans to enlarge it but it was very early days in groundwater production.

### End of Side A, Tape 3

### Side B, Tape 3

- H But then I was dead unlucky I hadn't hit the place before [the Pacminex affair] came up and of course that involved me in a few sparks. Fortunately the Department of Environment was very much opposed to it.
- R It was the EPA's first major time when they showed their claws, wasn't it?
- H That's right. And they didn't have very much in the way of powers under their act. Their act was very much one of cooperation with existing departments. Brian O'Brien had just been appointed, only just been appointed, and there was a Professor of Botany, I think, with him and Pat Adams, the lawyer, was the third member. And very fortunately, they kept Pacminex out [laughs]. By this time, of course, I was on the MRPA and had a voice there. It was such a substantial matter, as far as I was concerned, that I yielded myself a job of running a research group to look at bauxite mining in the Darling Ranges.
- R Because when Alcoa first started there was very little environmental requirements on them, was there?

- H Of course, they came in originally in a small way and they just kept on growing. I can understand Parker and Munro being favourably inclined to such a small proposal. Even the Met. Water Board's reaction to them was that anybody that went onto the catchment had to install septic tanks. They weren't worried about salt, but of course, in the Public Works we were worried about salt, because we were face to face with it in so many areas. But we didn't know much about it. No, it was my understanding at that time that the first warnings of salt had come from the Mullewa area, but more recently, I've learnt otherwise. Although I didn't know that they had done some clearing on the Mundaring catchment with bad results.
- R Yes, that was in the early days, wasn't it?
- H It was in the first clearing. The first clearing was raised above R.L. 420 [feet] level to clear all around the top water level. That's when they got a bit of salt, because it was at the western fringes. It shouldn't have been too bad there, should it? It is the country further back that produced the salt. But this steering committee that we developed to look at the salt problems was very much an inter-departmental one with all the major departments involved. A stalwart in it was Maurice Mulcahy from the Department of Environment, but there were representatives from the Agriculture Department and the Forest Department, and CSIRO were great contributors.
- R Oh yes.
- H And gradually, a bit of sense came out of it all.
- R Wasn't one of the Alcoa mines very close to a water catchment area?
- H Yes, it was. It was near the South Dandalup Dam. South Dandalup was just in its final stages when I moved over. Of course, South Dandalup was the dam that was threatened.
- R Yes. That was a large earth dam, wasn't it?
- H It was a large earth dam.
- R Without a core, or something.
- H A sloping core, I think. Yes, yes. Like a chimney.
- R Oh.
- H And it was a site where considerably more storage was available at the top level. I think South Dandalup was designed to store five times the annual flow, which was much higher than was usually the case. You know, it was usually two annual flows or thereabouts. Canning, for example, at that time, was considered to be under regulated, and in my time there, we went to the stage of getting a second dam designed for the South Canning.
- R Why did they allow five times the annual flow?
- H Because they could get it so cheaply, you see,
- R Oh yes, I see.



H And our rule of thumb in the Public Works Department had been that run off in a wet year in comparison with run off in a dry year was as the 3.5 power of the ratio [of the two rainfalls]. In other words, if you got twice as much rain in one year as in another, you would get [2 to the power of 3.5, or] 8 times 1.414, or approximately 11, times as much run off. So we have had some tremendous [variations in the run-off into] these dams [over] time and I think the idea of perhaps getting a bit of extra water was a good one [at South Dandalup]. But it makes the way of reporting to the public today rather silly, because you speak of the dams only being 30% full when you've got this sort of situation. You know, even most dams are designed for twice the annual flow.

There was movement in all areas in the Water Authority at the time. The next dam was the Wungong Dam. We were looking at that. We were pushing with groundwater as fast as we could, and also endeavouring to reserve the catchment areas because we wanted to get in ahead of farming and that sort of thing. Yet it was very, very difficult to get a reservation over even a groundwater catchment, particularly a groundwater catchment, when you couldn't say we wanted to develop it next year or [at a particular time], when really you are [reserving for] some years ahead.

R The groundwater pollution control areas, were they a new thing, then? Did they require a new type of legislation?

H No, not new. They hadn't been around very long. But where would they have been introduced?

R Gnangara and Jandakot?

H Well, that was for the Metropolitan. I think they might have had a genesis in the Public Works Department. I guess, Wicherina would have been protected. But there had been some drilling in the inner areas where subdivision had already occurred. The name of the treatment plant just slips my memory.

R Was that Gwelup?

H Yes, it would be Gwelup. There was a lot of water there. It had been drilled ahead and when I came to the Met., there were [test] results coming forward. So we did decide to build that treatment plant. The water quality was a little bit different to the others in so far as it was high in  $H_2S$ . Yes, there was a different history to the water in its underground path. That one was introduced and we also went down to the southern areas where there were the areas of the Jandakot area south. And we had made reservations there, which were bitterly contested.

R They still are, aren't they?

H I suppose, yes. Yes.

R And what about sewerage developments?

H Sewerage was, I suppose, the major area of activity, engineering-wise, because in '72, the Commonwealth Labor Government introduced its Department of Urban and Regional Development.

R DURD

H DURD - with money to be made available, under fairly favourable terms, for getting rid of the sewerage backlog. Well, of course, Western Australia, particularly Perth, was the area with the major backlog; a backlog because it was built on a sandy plain, and because postwar development had taken place in areas which were away from the existing sewerage, from which extensions were only made if they met a financial criteria, which was very close to being an economic one. And this Department of Urban and Regional Development was particularly strong on the sewerage side of the business. It arranged conferences in the eastern states, made money available and worked very effectively. But they were trying to bring some sort of improvement to the procedures in the various states. They were trying to pick out the best from all of them and make that Commonwealth-wide.

Within the states there was a lot of state pride. They had run their sewerage and water supplies for a long time and rather resisted the inclusion of these young fellows from the Commonwealth.

R I suppose Sydney particularly.

H Oh yes, and Melbourne. Because neither of them had large sewerage backlogs.

R No.

H But, nevertheless, they were all interested in the money. {laughter}

That was one major phase, and the money that became available in those years was used in Western Australia for some enlargement of the reticulation areas. But it meant so much in getting some of the mains in place, the southern main, with outlets down in the Fremantle area, and the main to the Beenyup treatment [site in the north]. There had been a little bit of sewerage done with portable plants up there - with extended aeration plants,

R Were these the ones that had to be put in by developers?

H Well, no, I think the department put in the extended aeration plants. But by getting this money, we were able to get the mains through and to get a skeleton from which to develop.

Now, this had all been developed to meet an extension of the corridor plan of the Metropolitan Regional Planning Authority, which provided for growth in the northern corridor, and for a southern corridor, going down to the south, and also a south-east [corridor] going through to Armadale.

R Wasn't there talk at one stage about having the north-west corridor as one of Canberra's new cities. I think it was Salvado City or something. They had a fancy name for it.

H That would have been a little bit ahead of my time, but it was all Joondalup City when I came there: Joondalup, Armadale, Fremantle. They were the sub-regional areas. But the land development had taken place in a northern



corridor by three major subdivisions, owned by three major developers and they had been regulated by the device of giving them rezoning from rural to what was known as urban-deferred, which was later followed up as urban. To overcome the capital shortage for providing services, these developers had been required to provide reticulation, both for water and for sewerage. They had been required to make contributions to arterial roads. They had been required to put [some] lots onto the market [at] certain low prices. The government approach was that by having the lower price blocks on the market, that had the effect on the market price throughout, and of course, it suited the developers all right, because they were able to develop first of all the land that was away from the coast. That was the lower quality land and that was the land that they produced at the lowest prices. They were pretty low prices too. But there's not much sense in quoting the prices, because it all depends upon the values of the time. I think it had an effect of price control.

R The MRPA was the one who laid down the rules, those rules which applied to the developers.

H That's right. Yes. But these rules were really developed by sub-committees. There was one which came up with development standards, and of course, it was the Land and Housing Committee of the MRPA, [which I chaired], which made the recommendations as to how, and at what rate, the rezoning should take place, and the conditions that would apply. But it was the MRPA that had the final approval of those.

There was also another committee that had been developed to satisfy a requirement of the Commonwealth Government's Department of Urban and Regional Development. There should be a coordination of all these activities. The engineering and the town planning and the housing, they should be seen holistically (I think that's the word!). I guess, perhaps in large measure because of our size here in the west, we were closest to having achieved that sort of a goal of overall organisation. It was partly for this reason that the Commonwealth made us the offer to do a study of the development of the financial future of this water supply. And of course they were also very anxious to really get a measure of the state of the finances of all of these water supply and sewerage activities, because really, the financial statements took a lot of understanding. There were a lot of local rules incurred in them and a lot of, I suppose, government committee reasoning thrown into it. And it was after DURD had made an approach to the Hunter River to do this study, they turned to us.

R I think that's a good place to finish, if you don't mind, Harold.

H Yes.

**Pause in tape**

**Third session (31<sup>st</sup> March 1999)**

R Good morning, Harold.

H Good morning, Richard.



R This is the 31<sup>st</sup> of March, and I am speaking to Harold Hunt. This is the third session, in which we will talk about his life and career.

At the end of the second session, Harold, we had started talking about the Binnie Financial Management Report about the Water Authority. Sorry, about the Water Board.

H The Water Board in those days, yes!

R Before we get to that, perhaps you could tell us something about the situation of one aspect of the Water Board, the sewerage system, when you first took over. It first started with the Subiaco works.

H Yes. The Subiaco Works went back to the first days of the then [Water Supply, Sewerage and Drainage] Department, and it, in turn, was enlarged when the treatment of sewerage on [Burswood] Island was terminated, because it was polluting the Swan River very badly. Before, perhaps, giving any detail of the treatment there, it's well to realise that Perth is located on a flat sandy plain, which is quite unusual when you come to providing sewerage.

The old story that the shape of the land determines the form of the city doesn't apply here because the whole lot is quite flat, and that combined with the fact that there's a reasonably high groundwater level, means that the type of system that has evolved is very much one of particular zones discharging into a pump station, which in turn, [discharges through] another system. I think, in my day, there were something like between 250 and 300 either pumping stations or ejector stations. Of course, this meant that the sewage was in the pipes, or in transit to the treatment plant, over a lengthy period and this meant development of H<sub>2</sub>S. As most of the sewerage pipes had been constructed in concrete, there was a fair bit of corrosion taking place, and certainly a lot of gas. One proposed remedy was to construct a fairly tall tower in Lincoln Street in North Perth, which wasn't in use for very long, because when the vent was opened, the atmosphere was fouled in the area. In fact, the people in that neck of the woods referred to it as the Pride of Lincoln Street! {laughter}

Well, this meant that the sewage arriving at the Subiaco Treatment Plant was septic. Initially, the plant only comprised primary sedimentation. [Later sludge digestion was added] and in the 1950s the plant had been modernised to some extent under Kenworthy, who had the benefit of the experience of Dr Mueller, [a German consultant,] when creating the renewed treatment plant. This, in turn, provided for secondary treatment, and the treatment of sludge, which after some time in the digestion tanks, was then placed out into open drainage areas and then sold off as garden fertiliser. The effluent was conveyed by pipe to the ocean and then discharged by an ocean outfall.

R And that was just the effluent?

H Just the effluent.

R Were there ever any raw sewage outfalls in Perth?



- H Only the [Burswood] Island treatment plant. That's the original treatment plant. When Mr Dumas designed a scheme for ocean outfall he picked up the sewage as it arrived in a tank by the river at Claisebrook, opposite [Burswood] Island. This was pumped by rising main into a gravity main which discharged into Subiaco. But Subiaco, for many years, had been a source of odour complaints.
- R Yes, I remember the smells at Subiaco.
- H In Kenworthy's day, there was [a municipal] tip on the opposite side of the road, and his approach was to always blame the tip! He said it wasn't the treatment plant. But it was a problem.
- R So that took the whole of the northern areas of Perth, did it – Subiaco?
- H And some of the southern. Yes. Some areas were pumped across the river.
- R And when did Woodman Point start? Was that the second one?
- H There was very little taken from the south side. The postwar scheme provided for sewerage on the south side of the river. That was designed by Morrison, and that was taken down to Woodman Point Treatment Plant, where the treatment was only primary. The effluent was discharged into the Owen anchorage area.
- R That was in Cockburn Sound.
- H Cockburn Sound.
- R And so when you arrived, there were a few package plants around for new developments as well, weren't there?
- H There was a considerable market for metropolitan land, and a number of developers were acquiring land and three very large parcels were acquired in the northern corridor. The MRPA corridor plan was approved by the MRPA in about 1972, and in early 73 for that area.

Now, when you are creating new drainage areas, your problems are immense, because not only do you have the very considerable expense of the treatment plant to contend with, but your gravity mains have to start from the treatment plant at maximum diameter and proceed back into the catchment area. Now there had been a policy of allowing septic tanks and this was regarded as being unsatisfactory. The MRPA and the Planning Department had indicated that future subdivisions should be provided with sewerage. The Board had the unenviable task of providing sewerage services for development when it didn't have its treatment plants constructed, and the mains were only just starting to edge out from the treatment plants. The answer that was adopted was to provide package plants which would cater for perhaps 5,000 people. The package plant would be put onto site and the treatment there was an extended aeration period, which produced an effluent of fairly good quality, which in turn, was then discharged onto the ground. Then either efforts were made to grow grass, or the effluent irrigated pine plantations. Sometimes, it was just got rid of it by putting it into the sand – for short periods, until such time as the mains were extended.

- R So in these northern areas, they are eventually going to go into the Beenyup Treatment Plant. Was that the plan?
- H That was right. That picked up really from about Bayswater northwards.
- R A pretty big area.
- H It was a very big area, yes.
- R And those ones that were developed, they all had temporary package plants?
- H There would have been perhaps a dozen of these plants scattered around, not only in the northern corridor, but also in the southern corridor, and on the south side of the river.
- R And down Kelmscott way?
- H Kelmscott, yes. The Carousel Stores, for example, required a service. So a package plant was put in there.
- R That's the one at Cannington, isn't it?
- H Cannington, yes. Noalimba Hostel, which provided temporary accommodation for people arriving in the country, was also served by a package plant.
- R It must have been a pretty frantic time for the Water Board and sewerage engineers in those days.
- H Well, that's right. I think they did fairly well to at least hold the fort for a period until such time as the national sewerage programme came into being, and this meant funds were available. I should mention that the policy of first the Department and then the Board had been to apply available funds, first of all, to ensure that water was adequately supplied, and then, if anything was left over, it went into sewerage. That was really the way it worked out. And there was a degree of leap-frogging, because some of the low-lying wetlands were left behind, even though they might have existed on the advancing front, because again, there the policy was that the extensions to the sewerage scheme had to pass a financial test.
- R So there were two big long-term treatment plants, the one at Beenyup, and the other one south of the river at Woodman Point. Is that right?
- H That's right. And Subiaco was providing secondary treatment and Woodman Point, primary treatment only. But as when I came in, in '72, Woodman Point was becoming overloaded, and two further sedimentation tanks were under construction. And a year later, the sludge treatment system was modified to provide for accelerated treatment of the sludge by heating.
- R Is this what they called the 'higher rate digesting system'?
- H That's right. Yes.



R Sludge seems to be one of the main problems with sewage disposal. Is that correct?

H I don't know that the disposal of sludge has been. Usually, it's only been treated. After it had been digested in the plant, it was then placed in shallow ponds and allowed to evaporate under the influence of the sun. It did mean that in the winter months there was a slower process of getting rid of it, and sometimes there was some odour from it. The major odour at Subiaco, and Woodman Point, was the septic sewage and the handling of it through the plant, although efforts were made to improve the quality of the sewage as it entered the system by applying chlorine to oxidise the sewage. It was always unsatisfactory.

R Was part of the problem because you had to start off in the treatment plant with larger sized pipes?

H That is in providing services to broad acres. And of course to ensure that what funds were available could be put to the best effect, the Board followed the example of other authorities throughout Australia in requiring the developer to provide the reticulation, and often, a contribution towards the treatment.

R When was the Beenyup Plant started up?

H Beenyup construction had started as I came over to the Water Board. There were three package plants operating, with effluent being discharged to a pine plantation [as a temporary procedure. Relief was forthcoming when the secondary treatment stream at Beenyup was constructed ahead of the primary treatment units so that the package plant effluents could receive early secondary treatment at the plant.]

At Woodman Point, there was no proposal to introduce secondary treatment because it was thought that Cockburn Sound was at that time capable of absorbing [the effluent]. That [opinion] had really been based on an environmental report, in which it was felt that there was an interchange of water in the Sound to beyond Garden Island. Subsequently that opinion was varied, because it was established that there was some interchange, but it was the same water going out and coming back in again. [laughter]

This affected our treatment of sewage down in that area. Although, immediately after my time, a new plant has been designed for Woodman Point which was still based on primary treatment.

**End of Side B, Tape 3**

## TAPES 4 & 5

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### Side A, Tape 4

- H But the design had allowed [space] on the ground for the secondary treatment to be installed if it was wanted in the future.
- R When did you change the discharge from Cockburn Sound to further out?
- H The original outfall remained, I think. We put a new outfall out from Beenyup, and of course, a new one had been put out from Subiaco in the 1950s or early 60s, but the discharge from Woodman remained as is, until it was replaced about 1980/1981.
- R The investigations shown in your book about alternative outlet routes, they weren't actually implemented in the end.
- H Oh, they were in 1981.
- R Oh.
- H They went out a little bit further with environmental blessing. We had our public meetings and that sort of things to contend with. Now, the funds that came via the National Sewerage Programme meant that we were able to accelerate the very costly construction of mains; and we got a substantial system laid down in those three years to provide for [expansion] by just submains coming into these mains, both north and south of the river - going back to about as far as Booragoon on the south side of the river.
- R Yes, I remember them putting those in.
- H Yes.
- R It is a very difficult job putting a large main through a residential area.
- H It is. There have been efforts of course in recent years to lay the mains without digging trenches, but it hasn't completely taken over.
- R So the funds that came out of the backlog sewerage system, a large block of that went to putting mains to sewerless areas.
- H And a lot to infill areas, because the Commonwealth wanted to see results in [terms of] septic tanks being replaced by sewerage. The Board [also] enlarged its construction force. By 1973 the wages staff of the Water Board was up to 2600.
- R Was it really?
- H And then on top of that, consulting engineers were being used and contractors were being used, with an emphasis on the infill areas from the original scheme.



- R I suppose they had to be given a priority too. Which are the most critical areas? Was it an environmental question?
- H Yes. Particularly areas that had high water levels and where septic tanks wouldn't work.
- R And close to the waterfronts then, I suppose. They would have high water levels anyway.
- H They would.
- R And around lakes.
- H Some of the quite inner parts of the metropolitan area were seweraged at that time. Victoria Park, Belmont, Claremont. I remember the golf course down there [at Claremont] being dug up and we had to lay mains through an old rubbish tip.
- R That was a terrible thing to do, wasn't it – go through a golf course?
- H Oh well, worse than that. We were shoring up the old rubbish tip too. It wasn't a very popular exercise for the men involved. {laughter}
- Beenyup involved a very substantial tunnel, taking effluent out to the ocean.
- R Was that because of the dunes?
- H That's right. And there was limestone, and the tunnel was put through there. It would have been about 1977 when it was all completed and Beenyup was operating as a complete unit. The Board was successful in winning the first [engineering] excellence award.
- R It was the first one, was it?
- H The very first one; the inaugural one. And it was for the design [of the Beenyup plant].
- R The sludge was incinerated in that case, wasn't it?.
- H It was incinerated, yes. And it was incinerated there and it was also incinerated at a plant at Westfield, near Armadale. But then that [procedure] was dealt a pretty severe blow when the price of oil doubled.
- R So what happened then. Did it still continue, or did you seek some other technology?
- H It was operating up until when I left, but I think it was ceased when the price of oil skyrocketed in the 1980s.
- R At that stage, Harold, what was being built as far as dam construction was concerned? The Wungong Dam came later, did it?
- H Yes, well, South Dandalup was finished in 1973, and by about 1974/5, the pipeline from South Dandalup, and the one which generally supplemented the pipes from the Serpentine [Dam] was linked up with the system by large mains all the way to the high level storage.

- R Where did the Canning tunnel come in?
- H The Canning tunnel [is from Canning Dam]. The heading was in the valley within 700 metres of the dam itself and it came out on the Canning River at Roleystone. That [tunnel] was largely unlined.
- R Was it?
- H Yes. [It had] a trap at the discharge end to catch any [rock] fragments that came down. There was some removable pipe there which allowed machinery to go in and clear out this – what shall we call it ?– it's not a silt pit, but it's a rubble pit.
- R The reason for putting the tunnel through was because the previous one was inoperable. Wasn't that an open channel?
- H It was. I was greeted with a failure of this contour channel in my first months in the Water Board. But by this time, with the enlargement of the system - the Serpentine and Dandalup [Dams] coming in - the role of Canning Dam was changing. It really now had to cater for peak flow [requirements]. The construction of the [new] mains meant that water could be more quickly transferred into the system.
- R To cope with peak periods.
- H That's right.
- R And a storage like Serpentine provided for the major flow?
- H Well, the peaks were getting larger with the system getting bigger.
- R That was quite a time ago, wasn't it? The construction of the Canning tunnel?
- H The Canning tunnel was operating from the beginning of 1975, and very shortly afterwards, Gwelup Water Treatment Plant came into operation as well.
- R All these works up to this period were financed by loan funds, weren't they?
- H They were.
- R Apart from the sewerage scheme.
- H Apart from the sewerage, which was worked on a system whereby, I think, 30% of its [funding] was in the nature of a grant and the rest was in the nature of loans which had to be repaid in a comparably short period - 7-10 years or something like that. But the 30% had some link with the normal arrangement of the [refund] of income tax money to the states.
- R Wasn't that was one of the reasons for having the Water Board Financial Study, apart from [providing information for the Commonwealth]? Wasn't the aim to reduce the amount you had to pay back on loans?
- H Well, partly. The reason for the study, primarily, was because the Commonwealth Department of Urban and Regional Development wanted to



find out just what the situation was with water authorities throughout Australia. The states were not giving very much away, and what's more, I don't think the states really knew, [laughter] because their financial statements were very complicated.

R The financial statements of the water authorities?

H Yes. In this state, they had been very much dictated by the Treasury Department and no doubt Treasury's accounting systems had an [historical rationale]. Well, they were based on an annual cash basis for a start. They weren't based on accrual accounting. When the Commonwealth made an offer to fund a study [in] Western Australia, it did so only after it had been unable to come to any agreement with the Hunter River [Water Authority]. They would have preferred [that authority], because it was just in Canberra's backyard, practically.

R That covers the Newcastle district.

H Yes. They also saw in Western Australia, a smaller authority and in this state there had been – perhaps largely because of its smallness – there had been a much better coordination between the planning process and the provision of services. This holistic approach was the heart and soul of DURD's approach to its brave new world.

R The people you used for the survey were Binnie and Partners, the British consultants. They had actually worked in Western Australia before, hadn't they?

H They were working in Western Australia. Actually the suggestion that Binnie be engaged came from Leo Devin and Norm Fisher who were running the DURD national sewerage programme. We had had contact with Binnie – in fact, we'd had a study [done by them] of the waters of the Swan and Avon Rivers, the tributaries of which were inclined to have a high salinity, but we were looking at our long term requirements. What we had in mind was being able to mix these waters with the waters from the Gnangara Mound.

R Are these the tributaries that actually come into the Avon in the Darling Range itself?

H Well, the Brockman was the major stream, which really ran north-south, and the [others were] the Julimar and tributaries such as that which came from the eastern branch of the river. This [study] had been done by Tony Downing who had impressed us very much.

R He was one of the principals of Binnie.

H He was. Previously, he had been involved with one of the [British] scientific organisations and Binnie had persuaded him to join them as a partner.

R Who managed the financial study for Binnie.

H Tom Hammond was the Australian partner. He was stationed in London, but he had charge of Australia and New Zealand and possibly also Hong Kong. I'm not too sure about that, but certainly Malaysia, anyway. He placed James Hetherington in charge of the study. James Hetherington's breeding

was impeccable, in so far as his uncle had been President of the Institution of Civil Engineers in about 1973, and his father, who was also an engineer, was the manager of British Gas, which had been very much involved in reorganisations and new procedures for financial [management].

R What I remember about the financial study from the newspapers of the time was that one of its aims was to make the Water Board more self financing. Would that be correct?

H Well, rather more than that. Although that was an important factor, it was also recognised that the consumption of water had for many years – probably from back in the 1920s – been increasing in Perth at an average rate of 5% a year. Perhaps a half of that, or a little more [than half], was due to population growth, but [the increase] also reflected an increasing affluence and [the fact that] people were changing their lifestyle in a way that involved a greater use of water.

R Were they using more on gardens as well, or swimming pools?

H Yes. In every respect – of course, gardens, washing machines and dishwashers, and all that sort of thing - over the whole period of 40 or 50 years. It was a stroke of luck, really, that we'd brought in [people] to look at the whole thing afresh and that they had access to the experience of the considerable reorganisation of the water industry in Britain, and also of the nationalised industries in Britain. They noted a number of things. The [Board's] Act itself was really based on British legislation of Queen Victoria's day.

R Was that the 1912 Act?

H Yes, it was. But you know, you can trace it back to English Acts of about 1870.

R Oh really.

H Yes. When people had the opportunity to say no: 'we don't want a water supply here'.

Binnie very quickly noted that the Water Board hadn't adapted its financial policies to adjust for inflation. It followed the system whereby each year it would estimate what it would cost to run the services for the next 12 months and then strike a rate which would ensure that it would perhaps cover those expenses, or perhaps [provide for] just a little bit more, for safety. One of the telling factors which Hetherington drew to the attention of the Board was that, [after adjusting for inflation, the price of water had been reduced by about forty per cent over a period of about 10 years]. {laughter} Now what effect did that have? It was an encouragement [to use water].

'Water', like anything else, has a price elasticity and this was one reason that the [use] of water was going up. The Board had required that its sales be metered, and probably in excess of 90% of the water was metered, which meant that the data was quite good.

R As far as water consumption, anyway.



- H Yes. So Binnie thought that the Act was deficient and that the pricing policy was wrong. As they went around amongst our staff, they would have very quickly picked up that the Board never quite knew what funds it would have, certainly not for more than a year ahead, or even for that year. It would probably be September or October before the programmes were finalised, because it involved interaction between the Commonwealth and the State Governments, and then back from the State Government to its departments. Binnie perceived a failure of the Board to inform the public of the issues that were facing water supply. In fact, I don't think the Government was very interested, because it was getting what it wanted at a pretty cheap price.
- R Yes. It reckoned that the Board was doing a good job if the consumers were getting cheap water.
- H Well, that's right. And there would always be a howl if the cost was to increase. And the feeling was that there were two very real problems that required interaction with the public, to get the public's feeling about, [together with], of course, the environmental matters which were coming to a fore at this time. They were just beginning to emerge. But the study noted that everybody accepted that septic tanks would eventually be replaced by reticulated sewerage. Reference was always made to 'backlog sewerage'. So much money was allocated each year for 'backlog sewerage'. One of the outcomes of all of this was that the name was changed from backlog, which indicated that it was inevitable that it would be [undertaken], to 'infill sewerag'.
- R So they were saying that perhaps not all backlog sewerage was necessary. Some of it can be put off until later.
- H Well, what they were saying was that it was going to cost so much money to do, and that it was going to have such a tremendous effect on the Board's funding and costs, that you should be jolly certain that it was necessary to do. [Costs were also affected by] allotment sizes, which in the past, had been very generous – the quarter acre lot with the 66 foot frontage. These were now being reduced in the new areas in the northern and southern corridors, but they were still pretty generous. There had to be space for the parking of two cars, and there had to be space for a boat to be stored away from the front of the house, and things like this.
- The other very important issue was that of private bores.
- R These were to provide water for gardens.
- H For gardens, yes.
- R Not for water supply.
- H No. It was realised that risks were attached to this, particularly in non-sewered areas. But politically, there was an ingrained sense that a man owned his bit of land and what was underneath it was his, and that the government should keep right out of it. This applied noticeably to people who had lived in the country and then moved into the city, and particularly to the politicians who were in that category.

- R They reckon that they have the rights to the water underneath their own houses.
- H Yes, they do. That was the way the legislation worked. To change that, there was a requirement to create a public water supply area and that had the effect of requiring a licence before you put down a bore. It didn't say that you wouldn't get one, but you'd have conditions placed on it.
- R Was Binnie against the use of private bores for gardens, or were they accepted?
- H Well, they thought that it was such an important matter and [so much water was being used], that it should be protected. In a few areas, people were striking trouble and were getting a bit of salinity, particularly at about that time, because when the Binnie report came out, we'd just had our three driest years in succession.
- R Yes, it was well timed, wasn't it?
- H That's right. And the sort of storages that were in the dams had decreased [to perilously low levels]. Groundwater was beginning to come in, but it was only beginning. In 1972, as I think I told you the other day, the Water Board was producing one million gallons a day from its Mirrabooka field. This probably very quickly got up to two or three millions a day, but it was still very much experimental. Most of it was from shallow artesian sources in the mound and was good quality water.
- R So what sort of percentage was that of the whole Metropolitan usage?. How many million gallons a day was used?
- H From bores?
- R No, from all sources.
- H How much was used from all sources?
- R Yes. A rough figure.
- H A rough figure, I'll cheat. {laughs}
- R Oh yes, whatever. You have got such a good memory for most things. You can't remember everything.
- H Well, here are some interesting figures. The average consumption per service in 1975-76 was 748 kilolitres - we're into kilolitres now. In 1976-77 - what's that, a year later - it was 675, and in 1977-78, it was 398. That 398 involved restrictions. Some gardens were allowed to deteriorate and die. But of course, the number of private bores kicked up at a tremendous rate. {laughs}
- R And that was all due to the dry period.
- H No, not entirely. Also the Board had by that time - 1977-78 - instituted a public awareness programme. For example, the *West Australian* used to publish a water budget for the coming week. At that time, we had an evening



newspaper here, and it used to give the results of yesterday's figures. There was a lot of interest in the subject, you know. Water suddenly became very important.

R And had the new charging methods come in by 1978?

H Yes, they were just about to come in.

R Did that have an effect? Apart from providing a more rational system for the Board, did it reduce consumption?

H Well, it is hard to tell, because there were so many factors involved. As you can see, there was a tremendous reduction.

R Isn't it – almost halved.

H It was. You know, it's a 45% reduction. And everybody got through. The public accepted it fairly well. Of course, they saw other things happening. The Wungong Dam was constructed, and the improvements to the water scheme went apiece. There were a number of service reservoirs constructed. Greenmount was one, and there was another one at Tamworth Hill, a very large one at Tamworth Hill, to look after the Rockingham/Kwinana area. A reservoir was built at Whitfords, and the principal reservoir, which was the Yokine reservoir, had been improved to provide better outlets to cater for peak demands. [Supplies to elevated areas] had been improved. Generally, they could see things were happening.

R A large area of the new housing construction in the northwest corridor, was that catered for by underground water, or did its water still come from the hills' dams?

H Some was coming from the hills' dams. At that time the economics of supply suggested that the cost of producing groundwater and supplying it to that area was about the same as providing water from our hills' sources, provided you made allowance for the cost of mains that were bringing it in. It used to just about strike even. [The former was capital intensive, the latter expensive to operate.] Of course, provision has been made now to transfer groundwater from the Gnangara Mound back to Mt Yokine reservoir which is the key reservoir in the system, [and also to Mundaring Weir].

But there was a time you could take water up there, but you couldn't bring it back! Which is the old business of the mains getting smaller as you go out.

R Coming back to the finance report, what did Binnie recommend about the financing of the Water Board's activities?

H Well, they recommended pay for use for water supply. For effluent waters from trade waste discharges, [for which] the Board was charging on a volumetric basis, they recommended that [the concentration of the effluent should also] be taken into account.

R That seems obvious now, doesn't it?

H Quite obvious, yes. It was. But always very difficult to do politically because it means that that some factories would have to go out of business.

R That was the industrial side of it. What about the domestic side?

H Yes, as to finances, they recommended a degree of self-financing. They argued that this was only equitable because the way the charging policy had worked – and I've just mentioned how, with the price reduced by about 40% over some 10 years leading up to this time – meant that today's consuming public was being subsidised by future ratepayers. It also meant that the depreciation policies were insufficient to replace the asset when it was worn out, because it was all being based on historical costs.

They produced a number of graphs which illustrated what revenue would be required per service if the [works] programme which the Board had given them of how it was proposed to provide services for the ensuing 20 years was to be undertaken [under three different scenarios]:

1. If things continued as they were.
2. If savings could be made.
3. If the charge for water provided for not only a more reasonable depreciation policy, but also for a reasonable return on the funds applied. – assumed to be 5%.

The three alternatives were analysed, firstly for when 25% of the cost was self-funded, and then for when 50% was self-funded. [Also provided for each] were the sort of revenue which would apply over the 20 year period, and the debt level would apply at the end of the 20 years period.

The outcome of all of this was that the Board was persuaded that about 25% of self funding was about right, and that this could be attained if the depreciation policy was increased very substantially to about 2-3%, not of the historical cost, but of the present day replacement cost. This made funds available and enabled longer term planning to take place. The public could also be informed of what was proposed.

R That was an important outcome, wasn't it?

H It was, and they made a big feature of this, saying that the annual report should be more broadly distributed. They suggested that a five year rolling programme be made available to all other government departments, to public libraries and so on.

#### **End of Side A, Tape 4**

#### **Side B, Tape 4**

R How was it presented to other government departments?

H In an informal way, mainly. The committee system was very much the way of dealing with things in the public service. For example, in my own case as the Chief Engineer for the Water Board, I had a place on the MRPA where I could espouse these matters.



- R Were the Binnie recommendations actually adopted by the government?
- H Well, we were very, very fortunate really that the Binnie report became available shortly after Batty. came to head the Board. He was very much a successful chief executive of a prosperous Australia-wide firm, and he'd been the chairman of the Chamber of Commerce. All of these things meant that he knew his way about; and how to deal with the government. The Binnie Report was handled, I thought, quite well, in so far as a launching was arranged, and that involved the Premier, Sir Charles Court, and of course, the Minister for Water Supply. [The Report] was presented to a broad spectrum of the business community in Perth and to other government departments. That was followed up with presentations, first to the back benchers of the government, then to the Opposition. There were discussions with developers, which were pretty fiery affairs, I can tell you. [laughter].
- And the five year programme was published which contained a declaration of the Board's policies. Binnie also suggested that the Board strengthen its staff in the environmental area and also in the financial area. Of course, the Public Service Board knocked us out cold when we wanted to get a decent environmentalist {laughs} involved in our organisation. Oh no, that's handled by the Department of the Environment.
- R Really.
- H Under Batty, the Board became much more independent and it faced up to its responsibilities too. It introduced a proper charging programme for industrial waste. It introduced a system of charges for developers. We had standard rates, depending upon whether the development was proposed on the advancing front or whether it was a leap-frogging effort.
- R So they knew what they were up for.
- H They knew what they were up for. I was horrified to find that members of our staff were negotiating with developers, which was probably very good for their egos, but it meant that you weren't certain of having a stable policy. They might have friends. Although in all my time in the public service, I've never struck any. {phone rings} Excuse me.
- R We will pause now, Harold.
- [Pause in interview]**
- R So we are talking about George Samuels as the chairman of the Board. He joined at the beginning of 72, and spent five years to the end of 76. He was virtually the chief executive then of the Board, though he was called the chairman.
- H Yes. He had been the first chief executive and he was experienced in water supply matters.
- R Batty was appointed from 1977. He had a very different sort of background because he came from commerce and industry, whereas Samuels had been a career public servant.

- H Yes, that's right.
- R Was that done on purpose?
- H It was very much the premier's appointment.
- R That was Sir Charles Court.
- H Yes. Batty had just retired as the chief executive of the Cumming Smith Mt Lyell Group. Very well qualified – he was an industrial chemist. A graduate in chemistry from the University [of WA], who had had experience in Britain before he joined [Cumming Smith]. He was a very competent practitioner and a very good chief executive who had come up through the Chamber of Commerce where he had been the West Australian president or chairman, or whatever the title was, and he really had had a lot of financial experience.
- R Was there a big difference between working for Samuels and working for Batty?
- H Very much so, because, whereas Mr Samuels wasn't so interested in the doing of things, Batty was. He had designed factories and run them and he'd look at an activated sludge tank and wonder what was going on inside there.
- R He was a chemist.
- H He was a chemist {laughter} and he was a very astute one. Despite the fact that he was retired, he still had a very active mind, which included going to Britain – I think it might have been annually, or bi-annually or some such period - to keep abreast of what was going on. When he was chairman of the Board and he went on one of his tours to England, he insisted upon going into the sewers of the City of London. He went through them in a boat and all this sort of business. And he rang me at home one night and said he wanted me to send a promising young engineer over so that he could expose him to these experiences that he was having.
- R To the London sewers.
- H To get a broader view.
- R He was the sort of person who would encourage the finance study and things like that.
- H No, he didn't [initiate the study]. He came in at the apposite time. I think I can claim to be the person who initiated the study. It arose at a dinner following the meeting of the National Sewerage Group in Canberra. Norm Fisher was a very senior person in Tom Urens' Department of Urban and Regional Development, and Leo Devin, who had been a consulting engineer, had also joined the Department. The three of us shared a table and we were talking around these things. Shortly afterwards, they approached me about whether the Board would be prepared to undertake such a study at the expense of the Commonwealth. So I saw George Samuels and the Board approved of it. That's how it came about. I am sure the reason that they came to us was, firstly, because they couldn't make a satisfactory arrangement with the Hunter River, Newcastle. Secondly, they were impressed by the fact that, as the chief engineer, I was a member of



the MRPA, and was very much involved in some of the initiatives that they were making in that area; particularly concerning urban works committees and things like that.

R I was going to ask you about the MRPA work. The Chief Engineer is an ex-officio member of the MRPA.

H Ex-officio, yes.

R Was this in Dr Carr's time when you were there?

H Yes.

R Was he the strong man behind the MRPA?

H He was the Chief Executive of the Planning Department, and as such he had an ex-officio position on the MRPA, and of course, the MRPA relied on the Department of Planning for all of its reports on all its proposals. When I joined in 72, April or May 72, I know they were trying to get my appointment through the Executive Council in a hurry, because they were going to take a vote on the corridor plan. As soon as I was appointed, I was receiving telephone calls from the press asking me what did I think of the corridor plan. {laughter} This was rather a bomb shell to somebody who had been the Chief Engineer of the Public Works Department and hadn't had anything to do with the metropolitan area.

R You were on a fast learning curve in town planning.

H Yes.

R But the corridor plan was particularly important as far as sewerage and water supply planning are concerned because of what you were talking about before about having fronts of movement in servicing.

H That is so, and again, because of this problem of the government having insufficient funds, there was a need to place conditions on rezoning so that the developer would provide services. Well, he was really attacked on two fronts; firstly by the government to provide arterial roads and sewerage and water supply reticulation, and frequently also areas for [reserves]. Secondly, he was approached by the local government to assist with sidewalks, and again, to provide some land for municipal purposes. Prior to my time, the government had appointed a small group which acted as a sort of liaison between the developers and the MRPA and the government generally. This had been chaired by Bob Hillman as Chief Engineer. He had negotiated some major developments in the northern corridor. When I joined it, an approach was being made by an insurance group, the Kaiser Etna Group, to develop the Ocean Reef area. So I picked that up, probably at a second meeting or something like that.

R So the MRPA had the power to tell the developers who had to provide which facilities.

H Well, the arrangement was that zoning went from rural area to what had been established as an urban-deferred area. To go from rural to urban deferred required a process which was open to public objection. There had

to be hearings, and it was a fairly lengthy and complicated process. But to [alter zoning] from urban-deferred to urban was within the power of the MRPA itself. So you would make land urban-deferred and then you would negotiate. When you set up an agreement, then the Housing and Services Committee of the MRPA, which again was chaired by the Chief Engineer of the Water Board, would make its recommendation and the MRPA was able to approve that recommendation in each case.

Another area where land had to be provided by the developer was for school sites. That was quite a substantial matter, both for primary schools and for high schools. In fact about 18 months ago I was subpoenaed to appear in the Supreme Court on a dispute that went back to an agreement with a developer, who by this time had sold his interest to somebody else, on the question of school sites. No, actually that case was about road reserves, [but it could equally have been about school sites].

R What if the developer had said, well according to my experts this land doesn't have to be sewered, you could use septic tanks on it? Would the MRPA say, well, according to our experts it has to be sewered and we won't rezone it unless it is?

H Well, firstly, it was well known that the provision of sewerage was policy for the Metropolitan Regional Planning Authority. Actually, development applications did not go to the Metropolitan Regional Planning Authority. They were handled by the Town Planning Commissioner, who was David Carr.

To put the requirements that were made by the state on a developer into a reasonable context, so the developer would know before he bought the land what he would be up for, a committee had been established in Bob Hillman's time to produce standards for development. It took years and years to come up with the thing. I would have been there a couple of years [before it was completed]. I didn't even know it was going on when I went there. I only woke up to it when they were getting near [completion], even though there was a representative from the Water Board on it {laughs}. It was one of our engineers who just hadn't reported!

R During this period, you mentioned before that some of your officers actually negotiated conditions with developers. How did that come about?

H Well, I guess the Board gave its imprimatur to such agreements. A developer would go and see the engineer for sewerage, for example, and say: how can I get sewerage here? And he would say, well you would have to do this and you would have to move this and do that. It must have been very costly on their time, negotiating with these people.

R And it was laying themselves open to accusations that they might be providing favours.

H Well, they didn't have a firm broad policy to adhere to. I think the Board was very definite that [developers] had to provide the reticulation. I think that was well understood; reticulation for both water and sewerage. But where a temporary plant was to be put in, an extended aeration plant, or a main had to be extended or the like, that was a fairly difficult problem. It was eventually solved by the Board, at Bill Batty's behest, agreeing on a



standard sort of payment, which included a headworks charge and so again. The developer then knew, beforehand, what he was up for. However, it must have been a very risky business for developers.

R Owners of those big new areas in the late 60s must have had some influence.

H The only way developers could be influential was to have a big area. On top of that there were lots and lots of small extensions. Now these cases were the ones about which the branch heads in water and sewerage were being approached most often.

R We've mentioned water and sewerage, but we haven't said much about drainage works.

H Well, drainage under the Act was most unsatisfactory and, in fact, one of the last things I did as the Chief Engineer was to put up proposals for amending the Drainage Act. Drainage had always been regarded as a local authority matter, and the only time the Water Board came into the act was where drainage [works] went through more than one local authority. When the Board did declare a drainage area, then a special rate was proclaimed. Water Board revenue was recovered from [an area supplied with] water and this was a different area to that which [was serviced by] sewerage and that, in turn, was a very different area from that rated for drainage. One of the decisions of George Samuel's Board was that you had to [rate the three services independently to balance expenses against revenue. In short, cross subsidy between services was precluded.]

R But some areas wouldn't have any drainage requirements.

H Some areas wouldn't have sewerage. They'd be on septic tanks. They wouldn't be paying a sewerage rate. At the time, the very cheap service was water, and that could have easily taken an increase [by way of a suspense account technique].

R So the amount of drainage work that the Board did increased during your time. Is that because they had less favourable areas to develop?

H Some areas were. We did put a drainage condition on an area in Ballajura, which initially I'd opposed at MRPA [for suburban subdivision]. But, you know, it was [a case of the initial drainage requirement occurring at the upstream margin of the catchment draining towards Ellen Brook.] The developer appealed against the condition, under the appeals system, and the appeal was upheld by Mr Malcolm (who is now the Chief Justice). Well, not quite upheld, [it was made subject to a contingency condition].

R Was that because there are a lot of lakes and swampy areas in Ballajura.

H Well, there is a swamp out there, and the water table rose while we were there, but the argument that was being put up by the developer was that we were deliberately not pumping as much water out of the area [in order to try and get the level up]. {laughter}

R What was the year in which you eventually retired from the Water Board?

- H 1980
- R 1980. You still had, how many years to go before you were 65?
- H Two. Exactly two.
- R May I ask you why you left two years early?
- H I was unhappy at the rearrangement that was being made, where a general manager was being introduced with a salary higher than that of the Chief Engineer. That is really, in essence, the reason and while there were those who accepted my point of view, I don't know that the local government representatives on the board at the time saw it that way. The incoming general manager was ex-local government.
- R Oh.
- H But it may have gone further than that. I never really knew. But I knew that there had been [supportive] recommendations made [on my behalf].
- R So you weren't eventually involved in the reorganisation of the Western Australian water authorities?
- H Oh no. In fact, the feelers were going out at the time and I was very much opposed to it, and so was Bill Batty, because we were just getting the Water Board into an economic unit which was becoming largely self-funding. While endorsing the idea that country areas be given good hydraulic services, it was accepted that it had to be done as a social benefit because it was impossible to run them economically.
- R Like the large projects like the Ord scheme which is still draining funds.
- H Yes. Irrigation was justified on the grounds that it provided closer development. As far as the Ord was concerned, it was developing an area of land which was going to take some little time to become self-supporting. As for the irrigation areas down south, the argument always had been that the state got some return by increased rail freights and things like that. It's very difficult to do a cost-benefit study on any sort of agricultural activity, because you have to make an estimate on what future prices will be. If rigorous standards had been set for the wheat industry, it would never have got off the ground here, because when you are selling on a world market and your farmers are operating in a country where tariffs protect manufacturers, it's not a level playing field, to use that overused expression of today.
- R Your officers who were head of various branches in the Water Board, they were obviously involved in the reorganisation. Was that to their detriment, or was it to their advantage to be in the larger water field. I suppose some of them didn't benefit.
- H Generally [it was] to their disadvantage. I think most of them retired.
- R Did they?
- H Yes. Historically, the Public Works Department had been senior to the Metropolitan Water Supply Department and the branch heads in the Water



Board were half a kick behind those in the Public Works Department. But in my time, I had persuaded, I suppose, the Public Service Board, and no doubt, our own Board that conditions had changed and that the branch heads in the Water Board were deserving of the same level, and that had been [corrected]. Of course the Chief Engineer of the Water Board was half a kick ahead of the Chief Engineer of the Public Works, because there was a Director of Engineering in the Public Works. He was at the highest level.

R [In relation to] the comparative salaries, did the Professional Engineers Association have anything to do with arguing these?

H [Officially yes, in practice no.] As a matter of fact, I was Chairman of the Public Service APEA for a time – reluctantly, I must say. I felt a fairly senior person had to be involved, because that was important as far as the Public Service Board was concerned, and important as far as people under the Director of Engineering were concerned. It could easily go off the rails if it was too democratic. And of course, most people are interested in their own salary, and of course, this was a time when all the salaries had been reviewed following the engineers' Australian case. The engineers' salaries had all been adjusted on the basis of comparison with the Commonwealth Public Service, which had been the case heard by the court. And I would think that the comparison would have been to the advantage of all the states too, I might say, when compared to the Commonwealth. But the immediate result was that everybody else in the public service then got lifted up by the same amount! {laughs}

R Oh, did they?

H Yes, whereas the court had said this wasn't to be regarded as a benchmark for others in the public services. Our own [State statute], for example, provided that it should be [so]. And as soon as the engineers got their increase, the lawyers immediately came to and quoted the act. Lawyers are very powerful when it comes to matters involving public service salaries, because they handle the case for the Public Service Award– in the courts, anyway.

R All the other salaried staff all got an increase, the clerical workers and so on?

H Yes. It meant that the Public Service got a very substantial increase all the way through and I really think they deserved it too, in comparison to what was being paid outside. Although I know Binnie's engineers always found the Australian salary scale better than the British scale.

R Some of your engineers eventually went to work for the Water Authority of Western Australia.

H Yes, there was a general reduction in numbers, of course, and this was performed, not on the basis of what people meant to the organisation, but it was done on the basis of establishing a plateau, and age came into that. Well, it was done on the basis of offering retirement packages and this meant that some very good people left prematurely.

R So, some of the engineers who were in their prime in the late 50s and early 60s might have retired early.



- H There certainly were some, yes, particularly in the design side. I had been successful there too, in raising the status of design engineers which I had regarded as having been unfairly treated – again on a historical basis because originally all the design work had been done by draftsmen, whereas now there was an engineer structure in the drawing offices. And there were some very good people there.
- R When you left, had you any ideas of working as a consulting engineer, or were you thinking that arbitration would be interesting?
- H Both, really. Arbitration wasn't immediately available to me because a few years earlier the Institute of Arbitrators, Australia had been established and there was a requirement then for people to qualify by examination. Prior to that, it had been those who were already acting as arbitrators came in under the grandfather clause, but anybody coming in had to sit for the examination. It was all very disorganised at the time. You didn't quite know when the examination was going to be held or what the course really was. In fact, I got information from England. I was hopefully going to England to do a course there, but there wasn't a concentrated course. It was one lecture a week over a lengthy period, which is what has been instituted here in the last twelve months. You do a course at the university over a year, or over two terms, or something like that, which is a much more [satisfactory than earlier]. I did it under private study. One other and myself were the first ones here in WA to qualify by examination.
- R Were you really?
- H Yes. The two of us. The other chap, I don't think has done any arbitration work.
- R Now what fields of activity does arbitration cover? I always imagined it was only to do with the building, civil engineering, housing type work. Does it cover anything else?
- H Oh, it covers [anything and every thing].
- R Does it?
- H Yes, it covers anything at all. As far as I was concerned, it covered engineering. I wasn't particularly interested in building, although I did claim to have some experience in building for factories and that sort of thing. [At that time] I was also doing town planning appeal work – not through the Institute of Arbitrators, but through the minister's town planning appeal system. The system there provided for two avenues. If a developer was dissatisfied with a planning condition he could either go to a legally constituted court, [The Town Planning Appeals Tribunal], or alternatively, he could appeal to the minister. The minister had a committee of people who had had experience in these areas [to each of whom a case would be delegated for report to the Minister]. I did that for about eight years – it's far from a full time job, just as arbitration was far from a full time job.

**End of Side B, Tape 4**

**Side A, Tape 5**



H I did do a little bit of consulting work. I did some water supply work in Darwin and I did a little bit for the diamond mine up at Kununurra which was being designed and set up at that time.

R Argyle Diamonds.

H Yes, Argyle Diamonds - for their water supply. But they didn't follow my recommendations. They accepted one that Jim Paton's firm put up. I was keen on groundwater and Jim Paton's firm was keen on just putting a suction into the Argyle Dam.

But once I'd qualified [through] the examination then I was [eligible for arbitration work]. The main source for getting respectable cases was through being known by legal firms and that's where most of my work came from. Not that I did that many. The number of arbitrations that I did over the years would have been in the twenties, I suppose. Some major, some quite minor.

R This is an informal type of court, isn't it ?

H No, it wasn't really informal. That originally was the idea of arbitration, but an arbitrator - I must say - has the responsibilities of a supreme court judge, but he also comes under the appeals system which [provides conditionally for appeal] to a supreme court judge. The supreme court judges treat arbitrators perhaps a bit more severely than they treat themselves. You know, [procedures which judges might follow may well generate criticism if followed by arbitrators]. The result has been that arbitration here, for practically all the time in which I've been involved, has really been a mirror image of what happens in the courts. Not quite, you know; in later years people realised just what was going on and [have tried] to alter it. However, if ever you try to shortcut anything, you always ran the risk of it being thrown out by a judge. That, to my mind was disaster, because people, when they came to an arbitrator, wanted the matter finalised.

In the earlier years of my experience as an arbitrator, the arbitrator didn't give his reasons officially. He used to give them unofficially, and this was a system which had been approved of by the then Chief Justice, Mr Justice Burt. So what you would do is you would [publish] your award and you would also send a copy of your reasons, but you would disassociate them from the award. They weren't appealable.

But then the act was changed [so] that you had [virtually] to give reasons. And to some extent, I suppose, it did have the effect of separating the men from the boys, and this is where lawyers came to prefer certain arbitrators.

R In the field of arbitrating on engineering work, how many arbitrators are there in Western Australia?

H I think there are a little over one hundred members of the Institute of Arbitrators, but that includes valuers and architects. The big area of arbitration here has always been in the building area, but in more recent years the state has put that on a statutory basis and it's being handled by a board.



The arbitrators, in turn, are graded: one, two, three, and after Gordon Hill died, I suppose I would have been the only grade one arbitrator here in the engineering field, but there would have been two's and three's [as well]. They grade you depending upon what you did before you took on arbitration, or what you were doing when you took on arbitration, and also how you do in the examinations, and that sort of thing. And the idea is that the grade one arbitrator, he has the more difficult cases – and it's very much a legal exercise with both parties legally represented, including Queens Counsel at times.

And, of course, it's not straight out engineering. You also have to have a good knowledge of engineering law as is expressed in the case law, [and also of] arbitration law and the law of evidence. [At all times the arbitrator must act within the rules of natural justice.] For example, one arbitrator [ran a training] course for the Building Management Authority, then he accepted an arbitration involving those people. Well he brought down his decision and the other party appealed and [the Court] just threw him out. They said [he might] have been behaving in a just and upright manner but it might not necessarily appear that way to the other party.

And there have been cases where people have gone out to view a site and they've gone out with one of the parties. Well that's fatal and out immediately.

The only time I was involved with a Supreme Court appeal was one where there were three arbitrators. Each party appointed an arbitrator and the two arbitrators, as appointed, then appointed a third, and that was the one went to appeal and the court upheld the decision of the arbitrators. That was a very legalistic affair involving ship building, and the arbitrators included a lawyer and two of us as engineers.

R What other interesting cases have you had in engineering?

H In engineering, well, they were all pretty interesting. They were all different. I suppose the more major cases I had were some involving the State Energy Commission. One involving a contract for the coating of pipes for the gas pipeline, and another one again was with the gas pipeline, which involved civil works in association with the gas pipeline and I did have a [laughs] very majorish one, again on the same pipeline, in connection with quasi-mechanical matters, but the parties settled that one. So the State Energy Commission was a good source of work for me.

I had another interesting one concerning the control tower at the International Airport at Guildford. That was, of course, a concrete construction case.

R What was involved in that?

H Well, there had been a lot of industrial trouble and it was very much a question of deciding to what extent risks in this area had been transferred to the owner by the contract. Most arbitration involves an interpretation of the contract, and people get into trouble because they don't understand engineering law and they are inclined to get a bit personal about it all. But some of the most interesting cases that I have seen {laughs}, and cases that I really look forward to hearing, have been settled, and this is because the



parties are better advised and perhaps better experienced. One of them was one concerning the international Poulenc chemical group from France who had to do with some work down at Wagerup in association with one of the alumina places. It wasn't to do the alumina, but it was using by-products from there. That was settled, and nor did the work proceed, because there were environmental problems.

Another interesting one was to do with the construction of a wool scouring and lanolin extraction group, down at Spearwood. They were using a design that had come from Belgium. The sort of issues here were ones very much involving the responsibilities of the parties with a contract that was partly in writing and partly oral. It involved very much a dispute as to the quality of the drawings that had been produced. There was a terrible lot of pipe work involved in it – very complicated pipe work - and I had to make decisions, amongst other things, as to whether a great long list of drawings was satisfactory, and they were individual claims in respect of each of them. That was a pretty thick sort of a job.

I mentioned the coating contract for the State Energy Commission. [laughs] I had one to do with two hyperbaric vessels – you know, the iron lung - for the Fremantle Hospital, and this again was quasi-mechanical. I did some for local government authorities. Their Act provided for arbitration by two arbitrators and we had a couple of those involving drainage, but they were all fairly minor ones. I had another one involving drainage which, mercifully, was settled, because it was being treated as something that was very, very major.

Another one that I had for the Main Roads, comparatively recently, perhaps four or five years ago, concerning a new process for building roads, road pavements from bitumen, and it dealt with some construction through the town of Northam which had to be redone.

I've had a couple to do with professional services. My very last case, actually, was one involving an architect. His client was a dentist, and there was a very small sum of money involved. In fact, the cost of the arbitration, despite the fact that I reduced my fees and did all sorts of things to keep it down to a reasonable cost, was the equivalent of the amount claimed. But of course there was a counter claim again which was a little bit more. But that was quite an education to me because this was a case where one party was represented by a suburban lawyer. As to other party, he presented his own case, and there was rather a peculiar result. But the parties apparently were fairly happy at the end of it. So I came away feeling that it hadn't been a bad outcome.

You'll notice that {laughs}, even though I spent most of my time doing hydraulic work, it doesn't feature here. The reason, of course, is that anything involving Public Works or Met Water Board, I couldn't do! The Institution of Engineers in Canberra appointed me to do a dam arbitration involving the Bond Corporation at that Brigadoon development where a dam was built. Well, not only had I had some involvement with [one of the parties in the case but I also had a connection with a second]. I was involved with Binnies for some years, of course, and I had discussed [the dam] with the designer at Binnies. To complicate matters one of the other parties involved in it was Ove Arup, and my son worked for Ove Arup. So I had to opt out of that one. {laughter}



There were some land servicing [cases]. Again the parties settled one which I thought would be a very interesting case to look at; and likewise, a similar one up on the Pilbara to do with mining. Very much involving a cartage contract, but just when I thought that something was very interesting there, the parties settled. I was almost disappointed. {laughter}

R I suppose that's the most sensible thing for most parties to do in these cases.

H Yes, I think it is. If you know the law, then you know where you are at risk. Arbitration can be very expensive because you probably have four lawyers sitting in on the arbitration, and [some of the cases] might go for two or three weeks. But it is not like the celebrated one in South Australia which went for 12 months and the claimant hadn't completed his submissions at that stage. That's when they settled it. {laughter}

R That's very interesting.

H I think they would be the main [points] to do with arbitration. The town planning appeals covered all sorts of things.

R Most people think that the minister makes his own decisions on these. I am glad to hear that [he listens to a specialist adviser].

H He does. Certainly [that was my experience]. You know, you put in a report. You don't discuss it with the minister. He's got a man who allocates all these jobs, and he's the one that discusses it with the minister. I think I only had one of mine knocked back, and that was a case where I put in a report to say that it was with a heavy heart that I recommended against the applicant. The applicant actually won his case, so I wasn't very hurt over that. Sometimes they were pretty majorish to do with redevelopments of hotels and things like that. Some of them were quite piffling. Some of them involved some of these town planning requirements about providing road works and things like that.

R Which do you think is the best system? Appeal through a minister, or through a statutory one?

H Well, anything involving the courts has the advantage that the law is developed, and the decision is available to everybody. This is the case law, and when the next one comes up, then you know that inferior courts are bound by that decision. They must [distinguish or] bring that same decision down. If the high court brings down a decision, you know that the supreme court is bound by that decision. The disadvantages are that – well, particularly in the town planning area – the process is almost free to the developer, whereas if he went into the Town Planning Appeal Tribunal, he would be heard by somebody who had the qualifications of a judge and was being paid about at that level, and he also would require a solicitor, a barrister, to present his case.

R But the ones that go through the minister, there's no record of why the various decisions were made?

H No. No record at all.



- R Not even on the ministerial files?
- H Well, I suppose it would be on the files, but I don't know that they would be available. I suppose [some] would be available under the Freedom of Information legislation. The interpretation of the act was a little bit ambiguous. I always took the view that you were bound by law, but more recently, not at the present time perhaps, but under a previous minister, the attitude more was that he applied his discretion and used commonsense. The result was that the appeals to the minister were being very successful. And of course everybody went that way.
- R What was commonsense to him wasn't necessarily commonsense to the lawyers.
- H That's right. Everybody is biased to some extent, and he was interested in individual efforts and he was kindly disposed to those people.
- {laughs} It was always quite interesting when occasionally a former minister for planning would advise an applicant. They always advised on the basis of how they had been persuaded as ministers, which is very much, you know: he's a good fellow, sort of fellow. They didn't concentrate on the law. But the decisions that were brought out by Malcolm when he was the Chairman of the Town Planning Appeal Tribunal have been very, very useful in setting the benchmarks for the law, in the definitions of words like "amenity" and things like that, which were very necessary.
- In other cases, you'd say, perhaps an arbitrator would have done better if he was well versed in the area, because he was more at home with the technical aspects. Arbitration is very much at the crossroads at the moment. People have been saying that it's really a mirror image of the legal process, but some judges, particularly in New South Wales take a different view. Personally, I think the ideal situation is for them to use the referee system and that's available practically in all the jurisdictions, whereby a judge can handle a case and he can send certain aspects of it out for investigation by a referee. The intention of this was really to cater for cases which involved accountancy problems and engineering problems and such like.
- The question of expert evidence has been very much to the fore recently and steps have been taken to ensure that experts are informed by their employing solicitors that their responsibility is to the court and not to the client. Experts have always been inclined to be almost witnesses for the party that has employed them.
- R Especially in patent cases, like in the cyanide process cases which I studied.
- H Yes, well, where experts got a very bad result was in some of the medical cases, you know, the Chamberlain case in the Northern Territory, and there had been other cases in very similar circumstances. I think it's largely problems here that have given rise to recent decisions for experts to be reminded of their responsibilities to the court.
- R So the referee would be impartial?
- H He'd just put up the report and the judge would accept it or otherwise.

- R He wouldn't be employed by either side. He'd be employed to the judge.
- H Yes, yes. That's right.
- R That would seem a better system.
- H Just as an illustration of ways in which arbitrations can be improved, and particularly in the use of expert witnesses, a judge in the commercial court in New South Wales had an insurance case to consider involving expert advice from hydrologists. What he did was to line up the hydrologists of all the parties involved - there would probably be about four to six of them - and he questioned them, and he was really happy with the result of doing it that way. But it was then pointed out that this was a system that really applied to some of the tribunals appointed under the Commonwealth government. The high court had indicated that they wouldn't have a bar of it because, they say, it fails to pass the test of natural justice. And this is the sort of area where judges, sometimes, are satisfied that they are using discretion in a judicial manner, whereas if an arbitrator did the same thing, he would be given out LBW.
- R Before we finish I was just going to ask you for one or two comments on some of the earlier engineers. We mentioned one just now - Tindale. He was on your original cadetship employment panel.
- H Yes. That's right.
- R What was your subsequent experience of him?
- H [laughs] We were paraded before him. And he was very much of the old school. He was a Victorian graduate and he had been the engineer for the northwest and he finished up being the Director of Works and Buildings [and Commissioner of Main Roads]. So he had charge of the engineering division and the architectural division and of the Main Roads. He came here in the 1890s I think. He presented a paper to the conference here in 1936.
- R He inclined to be severe with his subordinates. In Leigh Edmonds' book on the Main Roads, he quotes some comment that Tindale had written on a memo to one of the engineers
- H Oh yes, ...
- R ... and it was very abrupt ...
- H Oh well, he finished the career of a chief engineer of the Water Board over a piffling little thing which was whether a pipe down Marmion Street in Cottesloe and another one in East Fremantle should be four inch diameter or six inches diameter, which clearly was a case of personality clash.
- R Was that Parr, was it?
- H Parr, yes. Having read the little bit around it, I am quite sure Parr was being pressed by some of his juniors to [oppose the Director].

**Break in recording**



**(faint recording follows - then is repeated at normal volume)**

R We now are on the same day, the 7<sup>th</sup> April, but onto a new disk. I am talking to Harold Hunt about some of the engineers he was familiar with, or knew of when he first joined the Public Works Department.

Tindale stayed on a few years after his retirement age, I believe. Do you think that was to favour Dumas? Or was it just because it was the beginning of the war?

H I have no idea really, I mean, I was only a young cadet. I was unaware that Tindale had carried on as a matter of fact. I think Dumas came in at about 41 and at the time of [Dumas'] appointment, I know great score was placed on the fact that hydraulic engineering work was going to be a major area of activity with the Public Works and that Dumas was coming in at the age of about 54, which gave him a fairly lengthy tenure.

R You mentioned before that Frank Bottrell was Dumas' assistant.

H [laughs] Yes, that's right. That would have been probably when Dumas first came to Perth. When the Churchman Brook [Dam] was built, Dumas had an office in Armadale, but then he moved into the irrigation areas. And of course he was retrenched in the Depression, about 1930, but I think he kept working. All I know, is that he wasn't on the payroll.

R Who, Frank Bottrell?

H No, Dumas.

R Dumas, was it?

H Yes.

R So where did Frank work previously? Was he a contemporary of yours, or was he appointed earlier?

H Oh, he was in the group of cadets that were appointed probably about eight years earlier than ourselves.

R And he worked on the dam works as well.

H I think Canning Dam would have been his first experience. He was in charge of quarrying, crushing, and probably the sand contract. And I think he and Mr Don Munro would have been the young fellows who were silly enough to go up the towers and down the chutes and things like that.

R Oh yes. And when was he Dumas' assistant? Was that after the war?

H No, that was before he went to Canning Dam.

R Oh was it.

H Yes. Oh he was very junior. He may not even have been an engineer. He may have been an ex-cadet.

- R You mentioned that Dumas worked very long hours and Frank had to work the same hours.
- H That's right. Yes. {laughs}
- R Was that into the evening?
- H That's right. Mr Dumas used to close the door and say: now we will do some real work. This would be at 5 o'clock when everybody was going home. But Frank had been approached by Mrs Dumas to ensure that her husband got a proper meal at night, so they would go over to the restaurant and get a meal and carry on.
- R He must have given them quite a good insight into Dumas' work ethics.
- H Oh yes. He knew him very well and he knew that a lot was expected of engineering staff by Dumas.
- R Yet he didn't stay on in the department. He went somewhere else. Why was that?
- H After Samson Brook [Dam], he went up to the Ord and established the first irrigation experiment up there - did the engineering for it. Then he went into the services, and when he came out of the services, he was appointed as a construction engineer with the Metropolitan Water Board Department as it was then. He was working under Parker.
- R And you said he didn't work very easily with Parker.
- H No. I think that may have been one reason why he left. He was offered quite a good job with the Queensland Irrigation Commission. He was offered their construction engineer's position, whereas he was only ... well, I don't know that he was even a second kick for John Parker. He was the RE of a reservoir that was being built - being built with a four inch pump, concrete pump. And as he went to the newly formed Irrigation Commission, which was a mighty organisation. They had a mighty big construction programme. Frank was quite an experienced construction engineer in the dam construction area, having been successful at Canning Dam and again at Samson Brook, for a little while, which was regarded rather well. It won Dumas an Institution of Engineers' prize for the design of Samson and Stirling.
- R Did it?
- H Oh yes. Dumas was perhaps the only person who has won all the Institution medals. They are on display in the auditorium at the Institution of Engineers.
- R Frank also went into contracting later, didn't he?
- H Yes, after leaving Queensland Irrigation. He offered me a job there. The next thing I knew was that he was with Thiess, and was their Victorian manager. Frank had always [laughs] regarded engineering as an unrecognised profession and he always saw a great scope for journalists and insurance people. [laughs] He always avowed that he would finish up as



an insurance man. He would have made a very good journalist. He had that skill.

R He didn't end up as an insurance man?

H I don't know. He might have!

R He didn't come back to WA?

H He didn't come back to WA, no. He died at a fairly young age.

R Another one that I forgot to mention before was Dave Bryden.

H Dave Bryden. Dave was a contemporary of mine for many years and he was one of the three cadets who were appointed in 1935. Dave and I were the boys in Crimp's Hydraulic Engineer's Branch.

### **End of Side A, Tape 5**

### **Side B, Tape 5**

H Dave was also involved with early work on the Ord project. He was a very agile person and he was involved in doing the survey in the gorges up on the Ord. He was credited with having brought a sick Mr Dumas in [from the field], on horseback, when the latter, Mr Dumas, not the horse, was suffering from sunstroke.

R Oh

H But he went down to Stirling Dam where he was one of the big group of engineers down there. After Stirling, he became an assistant to Mr R. W. Edwards who was in charge of irrigation and drainage. His health was failing and Dave was his trusted lieutenant who was then promoted to Engineer, Irrigation and Drainage, when Mr Edwards had to retire through illness. Dave had a heart attack when he would have been just about 60. He retired and when I last saw him, which was not so long ago, he was in very good shape. He's a very devout member of a religious group of Quakers, and he was travelling the world for that organisation then.

R Was he the engineer who was the conscientious objector?

H He was. And that was why he was doing the work on the Ord during the war years.

R Did that affect his promotion, because he was a conscientious objector?

H Probably not, because he took Edward's job over in the late 40s, which was a senior job.

R That was approved when all the major irrigation works were being done down at Waroona.

H That's right. There was a district engineer at Harvey and they were doing a lot of work extending irrigation areas and replacing timber bridges with concrete bridges. Then, of course, the irrigation on the Fitzroy and the Ord were to follow, and Dave was involved with those.

- R Cedric Poole. Was he the third one of the three?
- H He was the third one of the three.
- R What happened to him?
- H Cedric, too, had a heart problem which caused him to retire, but just to give a short picture of his career: when he graduated, which would have been in 1938, because he was second or third year when he was appointed, he went on a wheat-belt water scheme, you know, an excavated tank job, and from there he was with a survey group, with Paul Paget, surveying [dam sites] on the Harvey River. Then he was with Mr John Gillespie as his assistant on Samson Brook. It was when he was at Samson Brook that he was involved in a car accident, and that brought me to fill the gap in the tunnel work [then in progress at Samson Brook]. He didn't come back until after Samson Brook. He went down to Stirling then, and then in the war years he was involved in the work that was done on behalf of the Allied Works Council by a group which would have been headed in the field, at least, by Stan Byass, with Mr V.C. Munt being generally in charge. They built oil tanks for the navy at Albany and Fremantle, and I think Cedric would have been involved in those. Possibly involved [in the construction of the] wool stores to store the clip and things of that nature, for the Allied Works Council.
- R A lot of works in total went on in those days, didn't they? Most people have forgotten about them now.
- H That's right. After that he went back to Stirling, and he was there in 1946 when the dam was finished, in the season of the 46-47 summer. From there he went to Kalgoorlie as district engineer in the country areas water supply. Subsequently, he came to Northam, as district engineer there. And then into head office as head office staff looking after the country areas and goldfields water supplies. It was here that he had this heart problem which caused him to take it a little more easy and he stayed with them until he retired. But his heart problem must have extended his life, because he is about now in his mid-80s.
- R He and Dave both had heart problems then.
- H Yes.
- R And went on to better things!
- H And I didn't have a heart, so I wasn't troubled. {laughter}!
- R That brings us to another DE at Northam, Reg Keating.
- H Yes, well he was much earlier, of course. Keating was senior to Munro and I don't know a great deal about him. He's well known for his work on the above-ground welded pipelines. People who know him well speak of his mathematical ability, but my contact with him was purely in head office and we were in different departments.
- H Keating was district engineer at Northam, postwar, and then came to head office. When the position of principal assistant was created, he became



principal assistant to the country areas water supplies. This was a period of expansion in that area where they did a lot of work in supplies to agricultural areas, and they also upgraded the main conduit to provide for the mining developments. He retired from there at the age, I think, of 65 and then did a five year term on the Metropolitan Water Board as the engineer on the Board.

R And going back a bit more, Cyril Dimond.

H Cyril Dimond was recognised as being a very innovative engineer. I have heard that Cyril Dimond had a scheme for the bulk handling of wheat long before that became a proposition. My first contact with him was when, as cadets, Dave Bryden and I were transferred to the hydraulic engineering branch. Dimond was doing survey work to provide a water supply for the southern agricultural areas. Of course, he had been involved in the construction of the Little Harvey Weir, or rather the raising of it - the original weir was built, I think, in 1914.

R That was before Mundaring was raised.

H Oh yes, long before Mundaring. It was Cyril Dimond who did the original designs and [field work] for the Samson Brook and Stirling Dams. When this work was transferred from the hydraulics branch to Mr Dumas, who was then with the Metropolitan Water Board, Mr Dimond was supernumerary. He went into the army in about 1940, and stayed in for a long period. When he came back, he became engineer for the north-west where he had the unenviable task of having few resources and great geographical distances to cover. When Mr Parker was the Assistant Director of Works, he [accompanied him] on one of his north-west tours. They got as far as Wyndham where [an exhausted] Mr Parker was put in hospital for a while. His comment to me, when he came back, was that he didn't know whether Dimond always worked like that or whether he was just too conscientious. And he had a heart attack.

R Did he?

H Yes.

R So engineering in the north-west was his last appointment.

H As a branch head, yes. Yes, his last appointment.

R Another one you mentioned was Roy Hamilton.

H Roy Hamilton, yes. Well, Roy worked for Mr Dimond. He was the district engineer at Port Hedland and he came out of university about 46 or 47 and volunteered to work in the north. And of course he was immediately appointed. [laughter] His interests in the north sprang from the fact that his father was a school master and had been up in the north, and the north appealed very much to Roy. He was up there for a full term. I forget what the term was, four or six years, something like six years, probably, with a trip to Perth every two years. And when he completed that term, he came down to, and he was put into our particular branch in hydraulics and we put him in as RE at Wellington Dam, where he held a job which he performed very



conscientiously. When Wellington was finished, there was a need for somebody to go up to Kununurra.

Roy was rather unlucky. Having already done a term up in the north, he didn't want to go up there, because it was very difficult on his family which were growing up. He went, but he didn't take the members of his family with him. He lived there as a bachelor. His efforts were very much appreciated by Sir Charles Court, because Roy was the perfect host. There was a very substantial public relations task to be performed up there, [where] he had all sorts of visitors.

He was the RE, which made him the engineer's representative on all the contracts that went on at the Ord – the power station, the diversion dam, the farming contracts. We prepared the land there, we ploughed it and got it all ready for a farmer to move on, turn the water on and work. Roy went through that and the construction of the cotton gin, and saw the cotton industry start. I lost touch with him as I went over to the Metropolitan in 1972, but shortly thereafter, Roy was appointed to some special north-west job which was the equivalent of about , at least in terms of pay, a branch head. But it would have been something in the form of a zone development committee. He would have been covering the entire north, because he knew the north well and he'd also qualified as a pilot. He had his flying ticket, and he could fly a plane and just loved to get involved in cloud seeding operations and things like that. He's very much a person who enjoyed the north. He loved fishing and loved the bird life and the botany of the area.

R So he stayed with the public service. He wasn't in private industry?

H No. He was in the public service where he was in the Department of the North West, working under Des O'Neill, as minister. Then Roy retired and he bought a farm in the Packsaddle farm area at the Ord, and he is still up there. I think he's got a native title claim against him [when he probably wants to] sell it. I think he probably would be ready to come out now. Roy had been very much involved in the early days of Wittenoom Gorge.

R Was he?

H Yes, and he was going overseas from Kununurra and got as far as Darwin and was suddenly struck ill. They were quite certain that he'd picked up the dreaded

R Mesothelioma.

H Yes, but fortunately, that didn't prove to be the case.

R So was he involved in building the town of Wittenoom or was in servicing it?

H Oh certainly with servicing of it, yes, but knowing Roy, I think he would have been nosing around the mine too. Just as one of our surveyors, Cyril Ion, he actually was the underground surveyor for the mine.

R Cyril who?

H I-O-N. He was very much the king-pin of the survey department on the Ord.



- R Harold, the next one I've got here is John Abbott.
- H John Abbott came to the construction branch in 1952. In fact, we got three that year, John Abbott, Stephen Shelton and Don Collett – they were the three top men [of their University year].
- R They were the three I've got on the list here actually. The next three.
- H Well, they were all in the same year. I think they either finished in 52 or they started with us in 52. John Abbott and Steve Shelton both had a tour at Wellington Dam. And they were there at different times and they were both [, in turn,] the concrete engineer. Whereas Don Collett, who was more inclined to the design side, had asked to go into construction because he had observed that, at that time, to make any progress in the department you had to be immersed in construction. There wasn't much future in design then.
- R He was honest enough to say it, was he?
- H Oh yes. Don did a circular tank for me on Mount Clarence at Albany. Clarence?
- R Yes.
- H No, I don't think it's Clarence. Clarence is the southerly one, isn't it? Melville, it would have been on Melville.
- R Yes
- H I think Don went from there back to design in some capacity, whereas John Abbott was the RE of Bridgetown Water Supply, which was a very sizeable job. I think I have already mentioned to you that Bridgetown was served from a natural forested area catchment, and they were down to either two or three gallons per person per day when we first moved down there. He built this very substantial scheme from a dam at Millstream. I think it was about 23 miles of pipeline and getting near the town there was a rising main and service reservoir. It gave Bridgetown a very decent water supply.
- Steve Shelton had spent quite a little bit of time as an earth works engineer. He built Carnamah town water supply. He did a supply for Perenjori. He spent quite a little bit of time designing and supervising the provision of roaded catchments for farm areas. He would have had two or three seasons of that. And then I think he had a period – I'm not too sure of this – but I think he had a period with Ken Kelsall in the irrigation area.
- Three very good engineers.
- R Shelton worked on north-west water supplies, didn't he?
- H He did a clay barrier on the Gascoyne River. It's the Gascoyne at Carnarvon, isn't it?
- R Yes.
- H A barrier was put into the riverbed, getting towards the coast, to intercept the flow of water down the stream bed. That was very special task and was

given a very special priority by the then Director of Engineering, Sir John Parker, who said this was a work that had to be done efficiently in time and had to be given top priority and Shelton was the man we chose to do it. Shelton, incidentally, as a cadet, had built a little masonry dam on the Murchison River where he was the only person on the job. He did all the wages sheets, the costing and the engineering [laughs]. He was only a boy in his teens, late teens, but he was the sort of person you could throw in at the deep end.

John Abbott became a district engineer at Harvey for all the irrigation work and he stayed with irrigation. He succeeded David Bryden as the Irrigation and Drainage Engineer. He was one of those caught up with fairly early retirement and he was working with one of the large consulting firms, in an irrigation and drainage [capacity]. He'd been very much involved with the ANCID, the irrigation equivalent of ANCOLD [Australian National Committee on Large Dams]. He was a very senior figure in irrigation and drainage world.

R Did Shelton and Collett stay with the department after it was reorganised, or did they take early retirement as well?

H I think they both took retirement. Steve Shelton, by that time, was chief engineer of the Public Works. He succeeded Kelsall in 1972 and I don't think he went over to the new organisation.

At what stage John Abbott went out, I don't know, but it would have been somewhere around that time because all that irrigation area is now put out to local boards.

R Going back a bit now, I was going to ask you about John Lewis and tidal power.

H Yes.

R Did he do that while he was in the department?

H Oh yes. He was the branch head for Investigation and Design. John did a drafting cadetship. Then he went to university and got his degree and shortly afterwards he went to Imperial College London and got his [qualification] in soil mechanics.

R A good combination.

H Soil mechanics was an area where we weren't very strong. He introduced tri-axial machines and we were designing earthworks properly from then on. John was a very, very good designer. It was John, as a very young engineer, who had a lot to do with that slot procedure at Mundaring. It may have been that both Munt and Don Munro relied very much on John for design work. And of course he did all the Ord work.

R And didn't he go to India for one of the designs.

H For the barrage. He and Dave Bryden went to India and came back with that barrage design. But it would have been somewhere around this Ord period when John came up with his tidal power proposal. This was, I think, the root



cause of his resigning from the department because the director of engineering at the time didn't see it as being in the right priority to put it forward and of course he very much had a mind of his own.

R Who was that at that stage?

H That would have been Sir John Parker.

R Oh.

H At that time all these people, up to that point, had been people who had spent years in the department in the depression years, and they were coloured by this to some extent. They were accustomed to fairly iron discipline and you did as you were told. But that wasn't John's idea, and he left and went over to join Halpern Glick.

R Halpern Glick and Lewis.

H Yes. Halpern, of course, had been in the architectural division in the Public Works and was held in high regard, but Halpern lost the job to Harding, largely on account, I think, of the preference to returned servicemen.

R What was the job that he missed out on?

H Oh, it was [that of the senior] structural engineer for the architectural division.

R Oh yes.

H Which was about the equivalent to a branch head.

R There was an immense amount of work going on at that time too.

H Oh yes. Royal Perth Hospital, for example, all of which I think would have been designed by Halpern. Halpern was in my year at university. He [already] had his degree, but he had to do a – what would be the word – an orientation course at an Australian university. He had to do the last three years of the course, years three, four and five.

R Oh, that's a long time, isn't it?

H It was.

R Wasn't he an Austrian Jew and that's why he came out to Australia?

H He was Polish.

R Polish.

H Yes. There were three of them. Leo Umschweif went to Melbourne. I'm not sure whether Leo finished up as a professor of engineering or had his own contracting firm, or something like that, but he was a much more aggressive type than Leon [Halpern]. Leon was a delightful person. Graham Glick, for example, looks upon Leon as a man who taught him everything. [I think Leo Umschweif changed his name to 'Symon' or 'Simon'.]

- R So who was the third of the three.
- H I don't know him. He didn't attend any lectures at university, so he didn't really qualify, whereas the other two did, but I think he worked at Canning Dam for a while. Umschweif certainly worked at Canning Dam. Umschweif was working on the conveyors which were used to transport the concrete to those areas that were outside the cover of the towers.
- R And then John Lewis left Halpern Glick and Lewis and started his own business.
- H Yes, and he got very much involved in development work. Secret Harbour was one.
- R Was it?
- H Yes. And he's involved now in a hydro-power proposal, other than that in Secure Bay.
- R Derby, isn't it?
- H I think it might be Derby. Yes, it is, just north of Derby. He's also involved in a salt proposal, which, I think, Graham Glick is also a partner in.
- R That's at Onslow, I think.
- H Could be. I'm not too sure. I've just heard that on the grapevine.
- R Someone we haven't mentioned is Ken Webster.
- H Oh yes, well, Ken worked for a consultancy in London, where he met his wife, who was a Bunbury girl, and they came to Western Australia, no doubt, because his wife's friends were all here. He came at about the time that the oil refinery was being built and the best the department could do for Ken was employ him as a draftsman. So he stayed there for a little while and then he went to Tasmania with the Hydro-electric Commission, who thought pretty highly of him. I think he had worked for Sir Alexander Gibb. I think that was the firm he was with in the UK. And when Commonwealth money was made available for the Ord scheme, of course, there was an immediate requirement for a bit of engineering design skill and Ken was attracted back. He was put in charge of John Lewis' design group for the Ord, and he stayed there and saw probably all of that through. And then when John Lewis left, Ken took over from him as Engineer, Planning, Design and Investigation. [Shortly afterwards] Ken [was involved with ANCOLD and was] its Australian chairman, and attended a lot of international conferences. Ken was also chairman of the Water Authority for a time. Would that be right? Presently, I think he's just taken over the chairmanship of the Waters and Rivers Commission or whatever it is. I know he went up to the islands with Minister Bridge who was making a presentation to somebody up there. Perhaps it wasn't the Water Authority, but the forerunner of the Rivers Commission. Again it is all past my time, I'm just repeating what I've been told. Hearsay, to use the arbitrator's term.
- R Some of the people who worked for you were Barry Sanders, and Ian O'Hara?



H Yes, they did. Barry Sanders, was the second kick in the Sewerage Department of the Water Authority. Barry was a man who, like Ken Webster, had applied and been given a Churchill scholarship and he did a tour of the United States, which opened up his understanding of sewerage matters. Later, he went back again. I think, first of all, he went under his own steam.

**Break in tape.**

R We were talking about Barry Sanders. He was second in charge in sewerage, you were saying?

H Yes, that's right, and he'd had international experience. He'd visited sewerage works in the United States. In fact, he was quite [an enthusiast] of United States' procedures. Barry looked after the treatment side of sewerage, whereas Don Montgomery, who was the sewerage engineer, looked after, shall we say, the hydraulic aspects of sewerage works, although he did exercise overall control. Barry was involved with the design of the sewage treatment down at Point Peron. He did that mechanical type one there. And the major work was up in the northern corridor.

R Beenyup.

H Beenyup, yes. Also the one at Westfield. He certainly would have had overall responsibility for all of these extended aeration plants, the package plants. Barry has done fairly well out of the amalgamation. I think his baileywick covers both waste water and drinking water. At the opening of the groundwater treatment plant the other day he was the man who was explaining it all. He's certainly retained his interest in sewerage and was very pleased with the special digester they've got down at the plant by the old quarantine station.

R Woodman Point.

H Woodman Point, yes. That's right. Woodman Point. His interests were tennis as you indicated and also APEA. That's the common interest of Barry Sanders and John Punch and John Le Page.

R The other one I've got is Ian O'Hara.

H Ian was a design engineer. He would have been very much involved with the design of Serpentine. I think he probably had charge of it. He too had done a little bit of extra study at London University, Imperial College, and in my time, he was in charge of drainage and of planning and design, because towards the end of my period there design in sewerage and design in major dams largely went out on contract to people like the Snowy Mountains. We used them as consultants too, when we had a bit of trouble at Wungong.

Shortly after I went to the Water Board I rearranged the organisation a little bit. The then Deputy Chief Engineer, Bill Benson, had charge of the operational activities and Ian had charge of the new works. That was the set up and of course I was so very much involved with town planning matters that I was trying to play the part that I'd learnt so well in the army where the man in charge is the man who has to be the front man all around the place, trying to implement policy, and you had people behind who made certain that they were available and ready to answer any immediate requests that

came in from the field and office. And that seemed to be a good set up, but it was a very hard one to introduce into the Water Authority, because they were [unaccustomed to it].

**End of Side B, Tape 5.**

**End of Interview.**